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Young children, computer coding, and story creation: An examination of first- and second-grade children's multimodal stories and literacy practices when engaged with a multimedia coding application

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Young children, computer coding, and story creation: An examination of first- and second-grade children's multimodal stories and literacy practices when engaged with a multimedia coding application

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ABSTRACT

Conceptions of literacy have changed over the past 20 years as scholars have recognized that the emergence of digital and multimodal technologies has resulted in the creation of new literacy practices (New London Group, 1996; Lankshear & Knobel, 2011). These new literacies are recognized as important both by scholars and educational organizations who have documented the importance of digital communication as it impacts one's success and opportunities in the modern world (Coiro, Knobel, Lankshear, & Leu, 2008; International Reading Association, 2009), and it is important to investigate how children develop new literacies practices as their development of digital communication skills can provide researchers understandings of children's learning and educators with practical implications for instruction.

This study aimed to develop an understanding of how first- and second-grade children develop their ability to create digital stories, a new literacy practice, through computer coding. The study utilized a mixed-methods approach to investigating how four first-grade and four second-grade children engaged in literacy practices through creating digital stories using a computer coding application. This study was conducted in a university reading clinic in which preservice teachers tutor children from the community to support literacy development. Three research questions were developed to guide this investigation, all of which relate to the ways children demonstrated their ability to engage literacy and communication practices through digital storytelling.

With the support of their literacy tutors, all of the children created three digital stories with a multimedia coding application, Scratch Jr, which was designed for five- to

seven-year-old children to provide them opportunities to learn computer coding through creating stories. The data in this study includes the children's Scratch Jr stories, field notes, observations, and documents including the tutor's notes on the children's processes and behaviors as well as graphic organizers created by the tutors and children. The data were analyzed for patterns that addressed the research questions and data triangulation was used to promote validity (Merriam, 2009). The children's Scratch Jr stories were also analyzed using a story grammar approach (Peterson & McCabe, 1983) in which story elements and structural patterns were identified and counted.

This research found that children engaged in a variety of standards-based literacy practices through creating digital stories with Scratch Jr. For example, the children sequenced events, included details, utilized temporal signifiers, focused on a topic, responded to questions, revised their work, and connected oral language to visual displays. Furthermore, during the instances when children engaged in a prewriting activity with their tutors, their stories were generally more focused and complete. The findings of this study are also presented in connection with the current research literature along with suggestions for instruction. This research contributes to the literature by addressing the limited research investigating young children's experiences creating digital stories, the use of fiction in digital storytelling, and young children's experiences using computer programming to engage in literacy activities and also provides implications for instruction.

CHAPTER 1

INTRODUCTION

Overview

The emergence and widespread use of digital technologies has deeply influenced what it means to be literate in the modern world (Coiro, Knobel, Lankshear, & Leu, 2008; New London Group, 1996). Conceptions of literacy have moved beyond the written word and shifted to include multiple forms of communication, including written text, oral language, visual images, videos, and more, which are often mediated by digital technologies (Kalantzis, Cope, & Cloonan, 2010; Kress, 2003). These new literacy practices (Lankshear & Knobel, 2011) include people's production and reception of multimodal texts through digital technologies. The International Reading Association (2009) issued a position statement that stressed the need for teachers to teach and children to learn these new literacies skills, as they directly impact children's ability to communicate and succeed in the modern world. Thus, developing new literacies skills is important for all children.

Digital storytelling is one type of new literacy practice. Robin (2006) describes digital storytelling as the process of creating stories through digital means, and that digital stories are generally multimodal texts created through combining different forms of communication including written text, oral language, images, videos, and more. This aligns with the concept of new literacies as it revolves around the idea of communicating ideas through digital and multimodal technologies. Furthermore, the Common Core State

Standards recognize the value of digital and multimodal communication, and the work of Foley (2013) illustrates how young children can demonstrate their ability to engage in these standards-based literacy practices through digital storytelling.

This study demonstrates that young children can successfully create a wide variety of digital stories through computer coding and engage in a variety of valuable literacy practices in the process, which they accomplished with the help of their literacy tutors. Throughout their time with Scratch Jr children engaged in a variety of literacy practices that are connected to current educational standards (see Figure 1 for example story by Eva; note: all names used in this study are pseudonyms). This research utilized the concept of new literacies as a theoretical lens that posits literacy skills goes beyond written language and also include digital and multimodal means of communication. In line with this new literacies lens, the concept of writing was examined from a broader perspective of story creation that included writing, but also included visual and oral means of communication. The children authored/wrote multiple digital stories in their story creation processes they engaged the used digital technology to communicate via written, oral, and visual information, which is recognized by current educational standards as being valuable processes for first- and second-grade children to engage in.

In line with the lens of new literacies, this study aimed to understand how children may demonstrate their ability to engage in these standards-based literacy practices through participating in a new literacy practice, which involved creating multimodal stories through using digital technology (Lankshear & Knobel, 2011). More specifically, this study examined how the children created stories using iPads, which scholars have noted as having potential to contribute to children's literacy development

(Hutchsion, Beschorner, & Schmidt-Crawford, 2012). Furthermore, the children created their stories via a computer coding application, which provides empirical support to the conceptual work of Hutchison, Nadolny, and Estapa (2015), who noted the potential value for children to engage in valuable literacy practices through computer coding. Thus, this study aimed to build upon existing scholarship to investigate how children engaged in new literacies practices through using iPads to crated digital stories via computer coding.

In order to determine how the children engaged in literacy practices through creating their multimodal stories in Scratch Jr, Common Core State Standards were utilized to aid in the analysis of the children's story creation practices. One of the Common Core Language Arts Standards utilized in this study recognize the value in young children sequencing events, incorporating details, using temporal signifiers, and conveying a sense of closure. Another standard used in this study highlighted the value of children focusing on a topic, responding to questions from adults, and making revisions to improve their stories. The final standard utilized in this study recognizes the value of children engaging in verbal communication that connects to visual displays as well as utilizing audio recordings to communicate with others. Examining the children's story creation processes in relation to these standards was a valuable way to understand the different ways the children engaged in current standards-based literacy practices through creating digital stories with Scratch Jr.

This study also utilized story grammar analysis (Peterson & McCabe, 1983) to understand how the children utilized different story elements and structural patterns in their stories. While this approach is typically utilized with children's oral narratives

(Champion, McCabe, & Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013), in this study the approach was augmented through recognizing how the multimodal elements of the children's stories (e.g., visual elements, written text, and oral language) corresponded with the story elements of story grammar analysis. This was valuable for interpreting the content of the children's stories through a multimodal lens.

Figure 1. *The Bright Glory Morning* by Eva

The children's multimodal Scratch Jr creations aligns with the concept of digital storytelling (Lambert, 2013; Ohler 2013; Robin, 2008), in which individuals create stories through digital means that often include multiple modes of communication, including written language, oral language, and images. While there is a robust literature base examining how diverse individuals have created digital stories and in the process engage in valuable reflective and learning processes, most of the literature focuses on older individuals, often adolescents and college students, who create personal and non-

fiction stories (Garrety, 2008). While this research is valuable, the present study examined how young children created fictional digital stories, which addresses current gaps in the literature.

Overall, the purpose of this study was to understand young children's new literacies practices related to digital storytelling and computer coding. This is important because developing new literacies skills is important for success in the modern world (International Reading Association, 2009; Lankshear & Knobel, 2011). Creating multimodal stories using digital technologies is one such new literacy practice and presents valuable learning opportunities for diverse individuals (Garrety, 2008; Lambert, 2013; Robin, 2008). Furthermore, computer coding is a valuable skill to develop and providing children opportunities to develop these skills in conjunction with storytelling can lead to student learning and literacy development (Burke & Kafai, 2010; Hutchison, Nadolny, & Estapa, 2015; Kelleher, 2006), and in line with these ideas, this study aimed to investigate these processes by examining the experiences of first- and second-grade children who created digital stories through a computer coding application.

Key Ideas

This section will describe key concepts related to the study. These concepts provide a background and context for the study. In addition to presenting these concepts, gaps in the literature are highlighted that illustrate the purpose of this study in its efforts to make a significant contribution to the literature base.

New literacies

Digital technologies have drastically changed the way people live and communicate in the modern world (Coiro, Knobel, Lankshear, & Leu, 2008; Lankshear

& Knobel, 2011; New London Group, 1996). Scholars in new literacies recognize that digital multimodal technologies have transformed what it means to be literate in the 21st century (Kalantzis, Cope, & Cloonan, 2010; Lankshear & Knobel, 2008). In addition to proficiency with reading and writing, people increasingly need to develop new literacy skills that enable them to engage in interpretation and communication processes through digital and multimodal means (Domingo, Jewitt, & Kress, 2014; Hutchison & Colwell, 2015; Kress, 2003). These ideas are also supported by prominent educational organizations, such as the International Reading Association (2009) who issued a position statement calling on educators to prepare students to develop new literacy practices through effective integration of digital technologies into literacy instruction.

Digital storytelling

One notable new literacy practice is the creation of digital stories (Lambert, 2013; Ohler, 2013). Robin (2008) explores the concept of digital stories and describes them as stories that are created through digital technologies by using a variety of multimodal components, such as images, videos, audio recordings, music, written text and more. According to Robin (2006), Joe Lambert and Dana Atchley were pioneers in the field of digital storytelling. They created the Center for Digital Storytelling in an effort to help individuals create digital stories that help them reflect on their personal experiences and connect with their communities (StoryCenter, 2015).

As is demonstrated in the work of Garrety (2008), digital stories have traditionally been personal and non-fiction stories. The focus on personal and non-fiction stories was influenced by the pioneering work of Lambert (2013), who began working on digital stories in the 1990s (Robin, 2006). For decades, Lambert has influenced the field and

advocated for people, particularly historically marginalized groups, to share their personal stories as a method of personal reflection and empowerment, as well as a way to connect with their communities.

While scholars have conducted extensive research on digital storytelling, there are gaps in the literature that represent notable areas for research. This section will examine the existing research literature and the identify the gaps that this research project aimed to address.

Young children. As Foley (2013) notes, most of the research literature on digital storytelling focuses on the experiences of older individuals, often adolescents and college students, creating digital stories (Garrety, 2008; Kadjer, 2006; Lambert, 2013, Skouge & Rao, 2009). This is valuable, but given the need for all students to develop new literacies skills (IRA, 2009), it is also important to investigate the new literacies learning experiences of young children, which includes digital storytelling.

In line with scholars' beliefs in the value of new literacies and digital communication (Coiro, Knobel, Lankshear, & Leu, 2008; Cope & Kalantzis, 2015; Lankshear & Knobel, 2011), the Common Core standards recognize the value of young children engaging in literacy practices through the use of digital technologies, which can be facilitated through young students creating digital stories (Foley, 2013). Given the lack of research on the learning experiences of young children creating digital stories and the value of new literacies and digital communication, it is important for scholars to investigate how children engage in literacy practices through digital storytelling.

Fiction. Most of the research on digital storytelling focuses on personal narratives and non-fiction stories (Lambert, 2013; Ohler, 2013; Robin, 2008). This is influenced by

the origins of the digital storytelling movement (Lambert, 2013), which focused largely on having individuals create digital stories to reflect on their personal experiences and share with their communities. As Garrety (2008) notes, there is substantial variation in these types of stories, as they embody different themes, including stories that focus on reflective practice, social justice, and learning-centered stories.

The wide variety of digital stories that scholars have investigated are interesting and often lead to student learning and growth, they nonetheless revolve around personal and non-fiction stories, and fictional stories are also an important component of children's literacy development. Given the value of fiction in literacy education and the lack of fiction-based digital stories, it is worth examining children's experiences creating fictional digital stories, particularly given the prominence of fiction in the early childhood curriculum.

Computer coding. Scholars in recent years have examined connections between storytelling, literacy, and computer coding (Burke & Kafai, 2010; Hutchison, Nadolny, & Estapa, 2015; Kelleher, 2006). The scholarship in this field is limited, and the interests of these scholars varies considerably. Kelleher (2006) recognized the underrepresentation of females in computer science and programming fields, and in order to understand ways to enhance females' interest and proficiency in computer coding, she decided to investigate the experiences of middle-school-aged girls and promote computer science engagement through pairing storytelling with computer coding. She found that the participants who used a storytelling version of a computer programming application, Alice, were more motivated to computer code than their peers who coded without the storytelling version of Alice, which illustrates both how people can engage in storytelling through computer

coding and how that process can enhance student motivation to learn computer science skills and knowledge.

Similarly, Burke and Kafai (2010) investigated the experiences of middle-school children who created digital stories with Scratch, a computer programming application designed for eight to sixteen-year-old children in which users can create games and tell stories via computer coding. They found that the children's familiarity with stories and storytelling guided their computer programming decisions in an effort to create a coherent story, and they also found that "storytelling [served] as a gateway into programming" (no page).

While Kelleher (2006) and Burke and Kafai (2010) investigated the experiences of middle-school children used computer programming to tell stories, Hutchison, Nadolny, and Estapa (2015) highlighted the opportunity for younger students to engage in literacy practices through computer coding, and their work places a heavier emphasis on literacy, which contrasts with the work of Kelleher and Burke and Kafai, who while interested in storytelling, have a greater focus on computer science. The work of Hutchison, Nadolny, and Estapa (2015) is largely conceptual and given the potential that they highlight for students to engage in literacy development through computer coding, an empirical investigation of how young students engage in storytelling via computer coding would be a valuable addition to the literature, particularly as existing empirical research in this area focuses on the experiences of older students.

Purpose of the Study

This study aimed to address gaps in the research literature by investigating the literacy practices of young children who created digital stories through a multimedia

coding application designed for five- to seven-year-old children. As noted above, much of the existing research on digital storytelling focuses on the experiences of older individuals, often adolescents and college students (Garrety, 2008; Lambert, 2013). Thus, given the limited research on digital storytelling with young students (Foley, 2013), this study aimed to contribute to the field of digital storytelling by examining the experiences of first- and second-grade children creating digital stories. Furthermore, digital stories typically are based on personal and non-fiction stories (Robin, 2006, 2008). However, fiction is an important component of children's literacy development and is particularly salient in young children's education, and thus, it is important to examine how digital stories can embody fiction. Finally, as scholars have recognized potential for student learning by connecting literacy, storytelling, and computer coding (Burke & Kafai, 2010; Hutchison, Nadolny, & Estapa, 2015; Kelleher, 2006), this study aimed to contribute to the limited research literature in this area by empirically investigating how young children can engage in storytelling and literacy activities through computer coding.

While a primary purpose for this study was to address gaps in the literature, I am also personally interested in how young children learn and develop literacy and communication skills through using digital technologies. As developing new literacies skills and communicating through digital and multimodal technologies is important for success in the modern world (International Reading Association, 2009; Lankshear & Knobel, 2011), I wanted to investigate children's literacy practices while creating digital stories. Furthermore, as computer coding is a valuable skill in life and can connect to valuable literacy practices (Hutchison, Nadolny, & Estapa, 2015), I was particularly interested in empirically investigating this relationship between computer coding and

literacy development. Ultimately, this study was designed to address gaps in the literature, but it was also deeply motivated by my interest in young children's learning and literacy processes through the use of digital technologies.

Research Questions

As this study aimed to understand how children engage in literacy practices through creating stories through using a computer coding application, three research questions were developed to guide the research and facilitate an understanding of how the children's story creation processes and their completed stories represent evidence of their literacy practices. These three research questions are listed below:

- Research Question 1 - How do children engage in literacy practices when using a multimedia coding app?
- Research Question 2 - What types of narrative elements do first- and second-grade children produce when using a multimedia coding app?
- Research Question 3 - What types of structural patterns of narratives do the participants create when using Scratch Jr?

Significance of the Study

This research aimed to fill a gap in the literature by examining how young children engaged in literacy practices through creating fictional, digital stories through using Scratch Jr. In order to examine the literacy practices of young children, the Common Core State Standards were consulted as they highlight valuable literacy practices and have been adopted by states around the country (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

Six standards were identified that are related to literacy practices that children can engage with through creating digital stories with Scratch Jr.

Given the value of stories and storytelling abilities in life and education (Garrety, 2008; Lambert, 2013; Peterson & McCabe, 1983; Stein & Glenn, 1982) as well as the importance of digitally mediated multimodal communication (Cope & Kalantzis, 2015; Kress, 2003; Lankshear & Knobel, 2011), it is a valuable endeavor to develop an understanding of how young children create fictional, digital multimodal stories and the elements and structural patterns of these stories, which was the ultimate aim of this study.

This study is significant as it makes a contribution to the research by addressing gaps in the literature related to the lack of 1) digital storytelling research involving young children, 2) digital storytelling research examining the the production of fictional texts, and 3) empirical research investigating how young children can engage in storytelling and literacy practices through computer coding. Beyond addressing these gaps in the research literature, this study found children engaged in a variety of standards-based literacy practices through creating digital stories via computer coding, and their stories included a variety of story elements and structural patterns. Furthermore, the study resulted in practical implications for educators interested in having their students engage in new literacy practices via digital storytelling and computer coding. Ultimately, as digital storytelling is a valuable activity in educational environments, this study support the research literature related to digital storytelling by illustrating how young children can create fictional digital storytelling through computer coding.

CHAPTER 2

LITERATURE REVIEW

Overview

This study examines how first- and second- grade children engage in standards-based literacy practices while creating digital stories with Scratch Jr, a multimedia coding application, and how they utilize various story elements and structural patterns in their digital stories (Peterson & McCabe, 1983). This chapter presents a review of relevant literature that identifies current research in the field and then identifies gaps in the literature that this study aimed to fill.

This chapter is structured as follows. First, as digital storytelling was preceded by non-digital storytelling, the concept of storytelling and its history are presented first, which is followed by an examination of storytelling in modern education. Next, literature relevant to the theoretical framework of this study (i.e., new literacies) is presented, as the concept of new literacies is relevant to digital storytelling and provides a broader context for the value of digital storytelling. Next, the concept of digital storytelling is presented and relevant research is examined, which begins with an examination of non-fiction and personal digital stories, which are prominent approaches to digital storytelling (Garrety, 2008). This is followed by an examination on the literature on fictional digital stories as well as how a few scholars have examined storytelling processes through computer coding. Subsequently, as this research aimed to analyze the children's stories and understand how the children use different types of story elements and structural patterns in their Scratch Jr stories, literature that identifies how various scholars have analyzed

children's stories for patterns, story elements, and structural patterns is presented next. Finally, the different bodies of literature described above are examined together to highlight gaps in the literature and provide a rationale for the present study.

Introduction to Storytelling

Stories are a central component of the human experience. People around the world have told stories since the beginning of humanity (Ong, 2015). Stories are told by people to share personal experiences (Havelock, 1986), convey and pass on important information about one's background and culture (Bauman, 1986; Carter-Black, 2007), and entertain peers and group members (Rubin, 1995).

The rise of digital technologies has deeply impacted the way people can tell stories (Lambert, 2013). People can now combine oral language, the oldest medium for storytelling (Ong, 2015), with visual images, written text, music, sound effects, and more in ways previously not possible, which has resulted in the rise of digital storytelling (Lambert, 2013; Robin, 2006, 2008; StoryCenter, 2016). While the rise of digital storytelling has been influential in education and cultural communication, it is important to explore the history of storytelling to better understand its functions and place in human culture.

Storytelling throughout Human History

Humans have been sharing a wide variety of stories orally long before the advent of writing systems (Ong, 2015). Stories can range from people sharing their daily experiences and views on the world to dramatically telling epic stories and legends. "From the beginning of the human race, interpersonal communication was an occurrence between members of a family in the same dwelling, or as two or more people met each

other in some public area—or, as society evolved, in town meetings or in a committee or in parliament" (Havelock, 1986, p. 63). These were important social activities that influenced the peoples' lives and cultural communities around the world throughout history and recognizing the importance of such storytelling, whether it be daily communications or sharing folklore can help us understand and connect with diverse peoples and cultures (Carter-Black, 2007).

A special form of storytelling that exists in many cultures is oral tradition, through which cultures around the world have used to share history, transmit values, and entertain the group, processes that were often intergenerational and used for the education and enculturation of the youth (Ong, 2015; Vansina, 1985). Lord (1991) illustrates how a wide variety of cultures including Greek, south Slavic, and Turkic cultures, have oral traditions about valiant heroes and warriors who possess the virtues of courage and loyalty, which served to inspire younger generations. Sharing such stories is a deeply social and cultural activity. Storytelling represents an important activity in which stories were often used to transmit values throughout the culture and from one generation to the next.

Oral traditions often served different purposes for enslaved Africans and African-Americans (Gates, 1989). Given the horrific conditions of being captured and imprisoned, many Africans used traditional stories as a means to keep part of their culture, even when stripped of their freedom and homeland. These oral traditions helped these populations deal with the appalling conditions of enslavement and aided in their mental cultivation of perseverance and hope for a better future (Carter-Black, 2007; Dance, 2002).

As the examples above illustrate, people throughout history have used stories as a means to share important cultural information and personal experiences, which shapes their lives and the lives of those around them. In this sense, stories serve as a means to educate one another (Collins & Cooper, 2005). Through both sharing one's own stories and experiences and listening to those of others, people grow and learn through storytelling. While much of storytelling throughout history has served informative and educational purposes in non-school contexts, it is also important to recognize the benefits of storytelling in classrooms and educational settings (Ellis & Brewster, 2014; Miller & Pennycuff, 2008).

Storytelling in Modern Education

As storytelling has been used throughout history as a means for individuals and groups to share culture and pass on knowledge and values to younger generations, it is understandable that storytelling has a notable presence in modern education. Cooper, Capo, Mathes, and Gray (2007) investigated the effects of a storytelling curriculum in three classrooms (one preschool, one kindergarten, one P/K mixed-aged) in comparison to three corresponding control classrooms who did not have a storytelling focus. They found that "in comparison to same-age children in like settings, participants in the storytelling curriculum showed significant gains in both vocabulary knowledge and literacy skills" (p. 251). These findings suggest that encouraging frequent storytelling activities in preschool and kindergarten classrooms can positively influence student literacy development.

Baskerville (2010) investigated the use of stories in a diverse secondary classroom in New Zealand, which was comprised of students of six different cultural

ethnicities. The aim of this study was to determine the effect of students sharing personal stories to help their peers better understand their personal and cultural backgrounds. Through a grounded theory analysis, Baskerville found that through this opportunity to share and reflect on meaningful personal stories "students fostered empathy, compassion, tolerance and respect for difference" (p. 109).

As illustrated by Baskerville (2010), stories can help students affirm their identities and culture. In a similar line of thinking, Eder (2007) interviewed eight Navajo storytellers to learn about their practices, views on storytelling, and ideas for school systems related to storytelling. She found that Navajo storytellers used stories to transmit important cultural values including tribal traditions and maintaining an appreciation and respect for nature. The storytellers believed that such practices could be integrated into the schooling experiences of Navajo children and that Navajo elders, who have the wisdom and ability to artfully share these stories, should be allowed opportunities to tell stories at school to help bridge the children's home and schooling experiences.

While storytelling engages students in numerous valuable practices including sharing personal experiences, developing communication skills, and engaging in meaning-making processes (Collins & Cooper, 2005), it also holds benefits for the teachers. Paley (2004) noted that listening to children's storytelling allows teachers to learn about the students' interests and development. As teachers can use this information to guide planning and instruction, encouraging children to tell stories and actively listening can help teachers better serve their students.

As illustrated above, telling stories verbally has a long tradition and engages individuals and groups in valuable cultural and communicative processes (Collins &

Cooper, 2005; Havelock, 1986; Ong, 2015). More recently, storytelling has been deeply influenced by digital technologies (Lambert, 2013; Ohler; 2013; Robin, 2008), which is part of a broader shift in modern education that recognizes the importance of emerging digital technologies that influence communication processes and result in the creation of new literacy practices (Coiro, Knobel, Lankshear, & Leu, 2008; Lankshear & Knobel, 2011). Thus, before examining literature related to digital storytelling, the concept of new literacies will be examined, as it is relevant to digital storytelling and will serve as a theoretical framework for this study.

New Literacies

In recent decades, scholars in education, language, and literacy have recognized the profound impact of digital technologies on conceptions and practices of literacy (Coiro, Knobel, Lankshear, & Leu, 2008; Gee, 2003; Kress, 2003; New London Group, 1996). Lankshear and Knobel (2011) describe how the emergence of new digital technologies result in new literacy practices, in which people increasingly need to interpret and produce digital multimodal texts to be successful in the modern world. This is a central component of the concept of new literacies. Developing proficiency in using digital technologies to interpret and produce digital multimodal texts impacts one's ability to be successful in the 21st century (International Reading Association, 2009; New London Group, 1996).

One prominent technology that has attracted the attention of researchers interested in new literacies and digital technologies is the iPad (Hutchison, Beschorner, & Schmidt-Crawford, 2012; Javorsky & Trainin, 2014; Sandvik, Smørdal & Østerud, 2012). The work of Hutchison, Beschorner, and Schmidt-Crawford (2012) recognizes the value of

new literacies and digital texts and investigates how a fourth-grade teacher and her students utilized iPads to support students' acquisition of new literacies skills via creating digital and multimodal texts through iPad applications. The students learned to utilize the affordances of different iPad applications to engage in various literacy practices and create their own digital and multimodal texts. The authors recognize the value of these activities, but also understand that educators should first consider educational goals and then determine which resources (digital technologies or otherwise) can best help the students reach these goals.

Sandvik, Smørdal and Østerud (2012) also examined elementary-age students and their literacy practices through qualitatively investigating the learning experiences of five kindergarten children engaged with iPads. The authors found that these children engaged in valuable language and literacy practices while working on iPad applications. However, it was not just the iPad applications themselves that facilitated learning, but also that the children engaged in a variety of valuable conversations with one another and their teacher. Thus, learning not only occurred through student-iPad interactions, but the student-teacher and student-student conversations that accompanied these interactions as well. This conclusion is echoed by the work of Falloon and Khoo (2014) who investigated the experiences of a class of five-year-old children working on iPads and found that the students engaged in valuable educational discussions that revolved around their iPad interactions, but the teacher played a valuable role in encouraging and supporting the children's discussions.

In a different approach, Simpson, Walsh, and Rowsell (2013) investigated how the experiences of a pair of third-grade students and a pair of fifth-grade students to

develop an understanding of their reading habits on iPads. Each student in was given his or her own iPad along with a reading task in which they read articles from the internet. Simpson et al. (2013) found that students regularly examined both screens to not only read of their own screen but also their peers. The children regularly tapped their peer's screen to visit new sections of text, which was mediated by peer-to-peer discussions. The discussions between the children regularly connected different texts sets and promoted comprehension across texts. This research complements the aforementioned research and recognizes that it's not only the iPads themselves that can promote learning, but also literacy-based discussions with peers.

Another area that has attracted the attention of scholars interested in new literacies and digital communication is the practice of storytelling on the iPad (Cooper, 2016; Javorsky & Trainin, 2014). Javorsky and Trainin (2014) examined 20 iPad apps that allow users to read and create digital stories, a concept that will be examined in depth in the subsequent section. The authors found that the apps varied considerably in terms of both appearance and function. While all of the apps allowed users to navigate between sections of the story, some apps possessed features such as the integration of oral language via audio recordings or the ability to play story-related games while other apps did not. Overall, Javorsky and Trainin recognized that not only do digital stories on iPads vary greatly from paper-based stories (e.g., books), but different storytelling iPad apps vary significantly from one app to another. They ultimately conclude that users (e.g., children) need to develop a sense of flexibility when engaging with digital stories on iPads as different applications have different features, and as students develop an understanding of different applications and feature types, they develop their ability to

learn from different applications and become more prepared to engage with new storytelling apps as they are released by developers.

All of the examples in this section connect to the central tenets of new literacies in that they recognize the value of interpreting and producing multimodal texts through using digital technologies. These are important processes and align with the positions of numerous scholars (Coiro, Knobel, Lankshear, & Leu, 2008; Kalantzis, Cope, & Cloonan, 2010; Lankshear & Knobel, 2011). Furthermore, educators have a responsibility to teach children these new literacies skills (International Reading Association, 2009), which align with current educational standards, including the Common Core State Standards Initiative (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). While students utilize a variety of digital technologies and engage in numerous new literacies practices, a prominent new literacy practice is digital storytelling, in which people, including students, utilize various digital technologies to create multimodal stories, aligning with central tenets of new literacies including digital and multimodal communication. The concept of digital storytelling has gained the attention of scholars over the last two decades, and it is explored in depth below.

Digital Storytelling

Robin (2006) describes digital storytelling is the use of multimedia, such as images, video, audio narrations, written text, and other forms of media, to tell and share stories with others. The process of creating digital stories often involves "selecting a topic, conducting some research, writing a script, and developing an interesting story [and] this material is combined with various types of multimedia, including computer-

based graphics, recorded audio, computer-generated text, video clips, and music," which can then be presented and distributed through digital technologies (Robin, 2008, p. 222).

Current conceptualizations of digital storytelling are deeply influenced by the work of Joe Lambert and Dana Atchley (Robin, 2006) who founded the Center for Digital Storytelling. Lambert and Atchley believed that the creation and dissemination of stories should not be reserved for elite or professional artists, but rather that people from a wide variety of backgrounds should be able to share their stories to connect with and educate their peers and the community (StoryCenter, 2016).

The ideas of the Center for Digital Storytelling, which became known simply as StoryCenter in 2015 (StoryCenter, 2016), have been extremely influential in the area of digital storytelling, a field that has blossomed in the last couple decades (Hartley & McWilliam, 2009; Lambert, 2013; Ohler, 2013). The work of Garrety (2008) examined the scholarly literature base of digital storytelling and identified five primary genres of digital stories: "traditional stories, learning stories, project-based stories, social justice and cultural stories, and stories grounded in reflective practice" (p. 14). While a single digital story may contain some overlap and straddle these genres, these categories are still helpful for conceptualizing digital stories and how stories can communicate meaning and can promote learning. Thus, these five genres will be explored to illustrate the breadth of digital stories and the research that has investigated and reported the significance of these stories.

Traditional stories

This genre encompasses stories that "connect students with personal events or stories from life experience" (Garrety, 2008, p. 15). It is important for students of all

backgrounds to be able to share about their personal history and experiences, and digital storytelling can be an excellent venue for sharing such stories (Lambert, 2013).

Foley (2013) investigated the impacts of a digital storytelling activity on first- and second-grade children. These children created personal narrative digital stories. Foley collected a variety of data including student artifacts, field notes, and interviews. Foley found that creating these digital stories provided resulted in deep learning in which students demonstrated proficiency of Common Core State Standards related to narrative writing. Most children demonstrated their ability to create sequenced events, details, temporal words to illustrate order of events, and provided a sense of closure. This study illustrates how digital storytelling activities can be used with children in the primary grades to help them meet current writing standards.

Another example of a traditional story was presented by Kadjer (2006), who examined the experiences of an eighth-grade boy who was largely disinterested with English class. Kadjer initially knew this student as a nonreader and nonwriter, but she provided this child the opportunity to create a digital story about his life as a reader through creating a digital story. This experience helped him recognize the value of multimodal communication and the activity ultimately enhanced his views of himself as a reader and someone who belonged in an English classroom, a process influenced by the student's interest in using visual images and oral narration in storytelling. Kadjer illustrates that students who are often disengaged with traditional English curricula can experience enhanced growth and engagement through digital storytelling.

The research literature suggests that digital stories related to personal narratives can result in student learning (Foley, 2013; Kadjer, 2006; Ohler, 2013). While digital

personal narratives represent valuable opportunities for student development, students can also investigate and present on a wide variety of other phenomena. We will examine how learning stories represent opportunities for student development next.

Learning stories

Many educational activities promote learning through having students research phenomena, events, and people and then share their findings with their teacher and peers. While for many years this was done without digital technology, Garrety's (2008) digital storytelling genre of learning stories are based on such activities that encourage students to research, synthesize findings, and present their ideas and conclusions to the group. These types of learning stories are apparent in the work of scholars such as Di Blas, Paolini, and Sabiescu (2012) and Hung, Hwang, and Huang (2012), which is described below.

Di Blas, Paolini, and Sabiescu (2012) investigated how students in Italy, ranging from 4 to 10 years in age, can collaboratively create digital stories that align with typical curricular activities and goals. Their data derives from PoliCultura, a competition for schools that "requires whole classes to create a multimedia digital story about a subject of their own choice" (p. 12). Participating classes chose their topic of interest and submitted digital stories for the competition. Questionnaires, interviews, and observations also served as data for analysis. Teacher questionnaire results (n=153) indicated that over 50% of teachers felt that in terms of educational benefit the digital storytelling project was "much better" than "achievement with respect to regular teaching activities [in terms of] interest in subject matter, engagement, communication abilities, [and] teamwork capacities" (p. 17). As the questionnaire results indicate, the researchers found that

teachers believed that a digital storytelling approach conferred a variety of student learning benefits when compared to traditional instruction.

Hung, Hwang, and Huang (2012) conducted a pretest-posttest quasi-experimental design study supplemented with student interviews that examined grade 5 science students in Taiwan comparing a project-based digital storytelling approach to a traditional project-based learning approach to science education. The unit was "I am the energy-saving monster" that included subunits on topics such as global warming and energy use and reduction. The experimental group engaged in digital storytelling through creating movies related to these topics, while the control group engaged in conventional project-based learning curricula related to the same topics. "The experimental results show that the project-based learning with digital storytelling could effectively enhance the students' science learning motivation, problem-solving competence, and learning achievement," a claim supported by the statistically significant higher score values for each of these constructs for the experimental group over the control group (p. 368).

As illustrated above, digital learning stories provide opportunities for students to engage, collaborate, and learn. Garrety (2008) notes that digital storytelling learning activities make the learning visible. This may be useful for teachers and their assessment of student development as well as student reflection on and appreciation of their own learning. Furthermore, the work of Di Blas, Paolini, and Sabiescu (2012) and Hung, Hwang, and Huang (2012) illustrates how learning stories have been successful for culturally and linguistically diverse students. While digital learning stories have various benefits, project-based stories, which often connect the students to their community, can also promote learning and engagement. Let's examine this genre of digital stories next.

Project-based stories

In this genre, students create digital stories that help them understand and engage with real-life issues and authentic problems, often interacting with the community (Garrety, 2008). Scholars such as Hull and Katz (2006) and Vasudevan, Schultz, and Bateman (2010) illustrate the value of connecting individuals to their community and providing them with opportunities to critically reflect on their experiences and environment.

Hull and Katz (2006) conducted their research at the Digital Underground Storytelling for Youth (DUSTY) community center in Oakland, California, an organization focused on promoting agency and identity development for traditionally underserved populations. Hull and Katz present a comparative case study, one case focusing on the experiences of a young man and the other on an adolescent girl. Both participants created digital stories about their lives. Hull and Katz's results indicated that creating digital stories helped the participants develop a sense of agency and a willingness to share their knowledge with others. This research illustrates the potential for digital storytelling experiences to engage underserved populations through a community organization, a valuable endeavor.

Vasudevan, Schultz, and Bateman (2010) also recognized the value of facilitating opportunities for individuals to reflect on their lived experiences and how those experiences were shaped by their community. These authors connected students to their community and conducted an ethnographic study in fifth-grade urban classroom that investigated how students developed their literacy identities through composing multimodal stories. These students created digital stories that connected them to their

community. They walked through their communities, reflecting on their experiences, and taking photos of significant and memorable locations, such as the homes of friends and families and their favorite parks. The research focused two students, an African-American boy and a girl who recently immigrated from Bangladesh. The participants developed confidence in their abilities to communicate as well as recognized their authority and expertise in understanding their own lives, creating new identities connected to literacy and communication in the process. Vasudevan et al. (2010) found that creating multimodal digital stories allowed students to develop their literacy skills while also promoting meaningful and engaging opportunities for the students to participate in class and connect their schoolwork with their community.

Such project-based stories that connect students to their community are valuable, and the examples above have some similarities to social justice and cultural stories, both seeking to empower individuals and groups who have been traditionally been underserved. However, social justice and cultural stories often seek to challenge the status quo and inspire change.

Social justice and cultural stories

Digital stories in this genre focus on social justice, culture, power, and oppression (Garrety, 2008). Lambert (2013), one of the founders of the modern digital storytelling movement (Robin, 2008), has documented his history in social justice activism, which influenced the creation of the Center for Digital Storytelling. Thus, this line of work has been highly influential in the field. Scholars such as Skouge and Rao (2009), Bliss and Fisher (2014), and others have utilized a social justice perspective to understand the

experiences of various historically marginalized groups through digital storytelling, and examples of this type of scholarship is presented below.

The work of Skouge and Rao (2009) illustrates how digital stories can be used by people with disabilities to demonstrate their stories and difficulties in life. One study participant, a university student, who was a wheelchair user, documented her experiences of being unable to use services and objects that many people take for granted. For example, she shared how the campus shuttle driver refused to pick her up because of her disability, and how many of the features of her apartment, which was advertised as "accessible", could not be used by her, including the shower. This student created and shared her digital story with peers who witnessed the difficulties of being a wheelchair user on campus. This digital story highlighted issues of exclusion and raised awareness of injustice.

Similar to the work of Skouge and Rao (2009), the work of Bliss and Fisher (2014) researched an organization dedicated to advocating for individuals with physical and intellectual disabilities. They used an ethnographic approach and focused on the digital stories of two individuals affiliated with the organization. The participants took used pictures, a script, and voiceovers to tell their stories and share their experiences with others. Bliss and Fisher found that "digital stories have proved to be successful advocacy tools…in the disability sector (p. 93).

In a different scholarly approach, McShay (2010) conceptually explored ways that digital stories can be used for critical multicultural education. With the goals of empowering disenfranchised individuals and groups, McShay argues that digital stories are a valuable way for students to assume the role of a knowledge creator as well as serve

as an activity that expand students' perspectives by listening to the stories of others. These experiences are mediated by the control and influence over one's own digital story, such as determining what types of media to use when creating and presenting one's story with others to make an impact on the community.

In a different line of inquiry, another group that can benefit from digital storytelling are migrant youth who often have international and multilingual experiences. Darvin and Norton (2014) reviewed the literature related to migrant youth and concluded that digital storytelling activities can help these students develop their literacy skills and affirm their identities. Furthermore, given that many migrant students are bi- or multilingual, students should have the opportunity to communicate their stories using their knowledge of multiple languages, which may take the form of speaking in one language and providing subtitles in another (Darvin & Norton, 2014).

Digital stories related to social justice and cultural perspectives can serve to empower individuals and groups (Lambert, 2013; McShay, 2010; Skouge & Rao, 2009). While this is a valuable genre, there is one more genre identified by Garrety (2008) that needs to be examined, stories related to reflective practice.

Stories grounded in reflective practice

Through creating digital stories that focus on personal reflection, performance, and learning, individuals can engage in valuable metacognitive processes that can influence one's personal development, which align with this genre of stories grounded in reflective practice (Garrety, 2008). Much of the research in this genre focuses on preservice and in-service teachers who engage in digital storytelling to reflect on their experiences and practice, largely with the aim of personal and professional development

(Garrety, 2008; Kocaman-Karoglu, 2016; Walters, Green, Wang, & Walters, 2011). These types of digital stories are valuable and illustrate how educators can actively reflect on their experiences through digital storytelling, which can lead to professional development and learning.

Kocaman-Karoglu (2016) investigated preservice teachers in Turkey through having them create digital stories about their careers and goals as teachers. This activity provided the participants an opportunity to first think about themselves and their own educational practices as well as formulate informed opinions on the value of digital storytelling in educational settings. The preservice teachers felt that this was a valuable educational activity that was a "fun way of learning, [and it was] exciting, motivational, practical, that it facilitated organization, and enhanced technology skills" (Kocaman-Karoglu, 2016, p. 1162).

In a similar line of inquiry, Long (2011) used a design-based research approach to examine how digital stories can support preservice teachers in reflection of their practices. Long analyzed the participant's digital stories in which they reflected on their educational and teaching experiences. Questionnaires were also used for data collection that illuminated the teachers' perceptions of the digital storytelling experience. Long found that while digital storytelling did help the participants reflect on their educational and teaching experiences, the reflections were relatively shallow for many of the students. She concluded that digital storytelling for preservice teacher reflection and growth has potential, but such activities need to be carefully facilitated by teacher educators to promote deep thinking and reflection. Additionally, Long found that the participants generally enjoyed creating digital stories more than they would have with

writing an essay, and thus, the digital stories also served as a motivating experience for the preservice teachers.

While the previous two examples illustrate some of the research of reflective digital stories with preservice teachers, the work of Walters, Green, Wang, and Walters (2011) focuses on 13 in-service middle-school teachers from Texas. These teachers, guided by leaders from Texas A&M University, went on a 31-day trip to China to learn about Chinese culture and education. During their trip the teachers were instructed to keep a journal, which they used upon their return home to help them create a digital story about their experiences. Walters et al. found the depth the digital stories and the reflections within varied significantly, with some focusing more on specific details of places and events and others exhibiting deep and insightful reflections. The researchers concluded that the digital stories facilitated valuable reflection and learning processes for the teachers, particularly as relates to developing an appreciation for different cultures, a characteristic that the researchers note is quite valuable for teachers in a diverse society.

The research illustrates that reflective stories have the potential for promoting learning through reflection for pre- and in-service teachers in a variety of contexts. More broadly, as Garrety (2008) notes, there are a variety of digital stories and genres, which have the power to empower individuals (Bliss & Fisher, 2014; Hull & Katz, 2006; Lambert, 2013), help them develop valuable skills and knowledge (Di Blas, Paolini, & Sabiescu, 2012; Foley, 2013; Hung, Hwang, & Huang, 2013), and promote reflection that leads to personal and professional development (Kocaman-Karoglu, 2016; Long, 2011; Walters, 2014).

While Garrety's (2008) five genres are valuable and reflect most of the research literature, these genres focus on non-fiction stories. These are obviously valuable, but fictional stories are also important, yet little research has been conducted from a digital storytelling perspective in relation to fictional stories. As indicated above, digital storytelling is a means of telling stories using multimedia technologies, including through incorporating images, written text, sound, and oral narration (Robin, 2008). Telling fictional stories through these digital means is certainly a possibility and one that deserves exploration by researchers.

Digital Storytelling and Fiction

After extensive review of the literature on digital storytelling, it was apparent that limited scholarship existed in terms of creating digital fictional digital stories. In Ohler's (2013) popular and influential work, *Digital Storytelling in the Classroom*, the index section only references one page on fiction, which addresses more of the artistic freedom of creating a documentary that may include a few fictional representations of ideas. Thus, the research on digital storytelling and fiction is quite limited.

Kesler, Gibson Jr., and Turansky (2016) investigated the use of digital storytelling with historical fiction in a diverse fifth grade classroom in the U.S. northeast. Data included student products, audio and video recordings of the activity, reflective notes, and a teacher interview. Students created historical fiction on segregation in the United States with multimodal digital storytelling methods. The researchers found that students engaged valuable collaborative processes that allowed both individuals and the group to contribute their own knowledge and skills. Students engaged in deep learning through conversations related to both the topic of inquiry, segregation, as well as the method of

composition, digital storytelling. The authors note that these were valuable processes, though ones that may be difficult for modern high-stakes testing to measure.

A different area that has combined digital storytelling and fiction is online fan fiction. Fan fiction is a genre of writing in which fans draw on various influences from popular culture, such as books, movies, and video games when creating their fictional stories and expand the fictional universes of these stories by developing and distributing their own work (Black & Steinkuehler, 2009; Chandler-Olcott & Mahar, 2003).

The work of Thomas (2007) utilized an ethnographic approach and examined the experiences of two adolescent girls who, after meeting online, collaboratively worked on fan fiction with one another for an extended period of time. These girls drafted their fiction after role-playing with one another through an instant messenger application. They expanded the Star Wars universe by creating their own characters and events that are inspired from ideas and characters from the movies. Thomas concluded that through their experiences creating fan fiction, these girls engaged in a variety of valuable literacy practices and educators should support students in their creation of fan fiction through digital means to enhance literacy development.

The work of Thomas is supported by the research of Curwood, Magnifico, and Lammers (2013), who conducted an ethnographic investigation of three popular fan fiction websites. These authors found that fan fiction website authors engage in a variety of literacy practices and regularly tell stories and engage their audience through using multiple modes of communication. Curwood et al (2013) concluded that participants engaged in valuable literacy practices and found a sense of community through creating and sharing fan fiction online.

The sections above have illustrated how children can engage in valuable literacy and learning processes through creating digital stories and contributing to fan fiction communities. Creating stories is clearly an important component of literacy development, and examining children's stories and narratives can illuminate children's knowledge, skills, and experiences. In order to develop a better understanding of how scholars analyze children's stories and narratives are examined, relevant literature is presented next.

Analyzing Children's Stories

Researchers have studied children's stories for many years (Labov, 1972; Peterson & McCabe, 1983, 1991; Stein & Glenn, 1979, 1982). Telling stories is an important social function that allows people, including children, to communicate and develop relationships with other people (Bliss & McCabe, 2008; Champion, McCabe, & Colinet, 2003). Furthermore, stories represent an enormous part of the elementary school curriculum, and thus deserve deep attention and investigation (Stein & Glenn, 1982).

Labov (1972), in his seminal work, *Language in the Inner City*, investigated the language and narratives of African-American youth. While he found notable differences in dialect between Black English Vernacular (BEV) and Standard English, he argued that "the number of structures unique to BEV are small, and it seems unlikely that they could be responsible for the disastrous record of reading failure in inner city schools" (p. 241). Furthermore, using his previous framework of narrative syntax (Labov & Waletzky, 1967), he found that increased use of evaluative statements, which indicate a speaker's thoughts on a story, during storytelling in the African-American community when moving from preadolescent to adolescent children.

Stein and Glenn (1979) proposed a method for analyzing stories through categorizing story grammar (i.e., components and structure), such as setting, events, and the characters' motivations and actions. After describing this framework, they illustrated an experiment they conducted in which they told children (1st and 5th graders) stories, and the children were told to listen carefully as after the story was concluded, they would need to retell the story to the researcher. The children's retelling of the story was analyzed for how many story components were accurately recalled. Stein and Glenn found that major settings and consequences were generally recalled with greater accuracy than internal responses such as goals, thoughts, and plans. The authors also found that the fifth graders tended to add certain types of additional information to their retellings (information that wasn't included in the original story) more than their first grade peers. For example, the fifth graders tended to add information about the character's goals and motivations that they likely established through inferencing. Stein and Glenn (1979) provided a valuable framework for analyzing children's stories and used that framework to investigate children's storytelling patterns.

Bliss, McCabe, and Miranda (1998) proposed a different approach to analyzing children's stories. They created the Narrative Assessment Profile, which can be used with children or "adults exhibiting communicative impairments" (p. 348). They propose six dimensions of narratives: topic maintenance, event sequencing, explicitness, referencing (i.e., "identif[ying]…individuals, features, and events"), conjunctive cohesion (i.e., "word or phrases that link utterances and events"), and fluency (pp. 348, 350, 351). Bliss et al., then examined the oral personal narratives of four children, one who was developing normally, two who had speech language impairments, and one child with autism. Their

analyses illustrates the appropriate use of narrative dimensions of the child who was developing normally. The children with speech-language impairments had difficulties with some dimensions but found success with others. The communication of child with autism was rated "inappropriate" on all six dimensions. A benefit of the Narrative Assessment Profile is that it is relatively easy to use in a variety of situations to assess children's oral narrative abilities, and "profiles of relative strengths and weaknesses can be developed as the foundation for intervention programs" (p. 359).

These approaches to analyzing children's narratives and stories illustrate valuable and prominent approaches to narrative analysis. More recently, the field has focused more on investigating narrative patterns of diverse children (Chang & McCabe, 2013; McCabe & Barra, 2013). Champion, McCabe, and Colinet (2003) examined the oral personal narratives of 10 Haitian-American children using three analytical approaches. Two of these were established methods for analysis: high-point analysis (Peterson & McCabe, 1983) and story grammar analysis (Peterson & McCabe, 1983; Stein & Glenn, 1979). The third approach to analysis was developed specifically for their study, an Africanist Analysis, which identified three common features of African oral literature: repetition, parallelism, and detailing, which is "piling or coupling one descriptive detail on top of another so that the whole performance builds up to a climax" (p. 391). The analyses indicated that the Africanist approach was best-suited to analyze these narratives as it was able to more frequently recognize the use and value of various phrases as corresponding to Africanist units of analysis. In the children's narratives, the presentation was not about conciseness of information, rather, verbosity was a valuable characteristic

that helped the children tell their stories in ways that aligned with traditional African storytelling.

McCabe and Bliss (2006) investigated the verbal narratives of 31 Spanish-English bilingual children between the ages of eight and eleven, 21 of whom had typical language development and 10 of whom had language impairments. The participants told personal narratives in both Spanish and English, which were analyzed according to language features, such as actions, evaluations, and orientation statements, such as setting and time. A major finding was that language impaired children elaborated significantly less on their narratives than their typically developing peers. Another major "finding was that bilingual children use[d] the same key narrative features regardless of which language they [were] speaking", and the data suggested the "narrative skills in one language will have a positive effect on the other language" (pp. 341-342) The authors argue that clinicians should try to encourage children with speech impairments to elaborate more fully on their narratives, something that the data indicated could be done in either Spanish or English and have benefit on both languages.

The research that has been discussed here illustrates some of the ways that scholars have analyzed the oral narratives of diverse children. One additional approach for analyzing children's narratives deserves attention. "Episodic or story grammar analysis emphasizes the purposive and goal-seeking aspects of stories" (Smith, 2000, p. 329) and has been used over the last few decades as an approach that illustrates important features and structural patterns within children's narratives (Champion, McCabe, & Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013; Stein & Glenn, 1979).

Peterson and McCabe (1983) built upon the work of Stein and Glenn (1979) and developed their own approach to analyzing children's oral narratives through identifying important segments of the story, which serve specific story functions, as well as the structure of these segments. (Note: this story grammar approach will be explained at length in the methods section.) It is important to note that while the story grammar approach has traditionally been applied to children's oral narratives and stories (Champion, McCabe, and Colinet, 2003; Peterson & McCabe, 1983; Schacter & Craig, 2013), it is possible to apply this analytical approach to a digital storytelling context as well, which would serve to fill a noticeable gap in the literature (McCabe, personal communication, July 5, 2016).

The existing literature highlights valuable inquiries and approaches to narrative analysis, which are valuable endeavors, but they lack focus on digital and multimodal narratives and stories, which are also important and increasingly valuable in modern society (Lambert, 2013; Ohler, 2013). The story grammar analysis approach holds potential for analyzing digital stories, and while the story grammar analysis has traditionally been used with oral narratives, it can be supplemented by creating a coding system that recognize the contributions of multimodal elements to children's digital stories (McCabe, personal communication, July 5, 2016).

Literacy, Stories, and Scratch

As illustrated through the aforementioned literature, children's stories, whether shared verbally or digitally, represent valuable communicative and creative learning processes (Garrety, 2008; Ohler, 2013; Peterson & McCabe, 1983; Stein & Glenn, 1979). Furthermore, as new technologies emerge that enable people to communicate and learn in

new ways, it is important to investigate how these new technologies affect students and their communication (Lankshear & Knobel, 2011).

In recent years, computer coding applications have integrated storytelling elements and features into their design and provide opportunities for users to engage in both computer science and literacy learning activities (Burke & Kafai, 2010; Hutchison, Nadolny, & Estapa, 2015; Kelleher, 2006). While these scholars all recognize opportunities to connect computer coding with storytelling and literacy, they each have their own approaches to examining the phenomenon. The work of these scholars is presented below to illustrate how different researchers are conceptualizing and investigating the connection of computer coding and storytelling.

Kelleher (2006) describes the development and use of Storytelling Alice, a program that enabled users to learn computer science and coding skills through storytelling. She started by using a previous version of Alice, which allowed users to drag and drop blocks of code to create animations and games. Kelleher added to Alice to create Storytelling Alice through adding capabilities of enhanced animations and multiples scenes as well as adding a library of characters and settings that could be used to promote storytelling. As she was interested in increasing female engagement in computer science and programming activities and professions, she then compared middle-school girls who used Storytelling Alice to peers using the generic version of Alice without the storytelling features. Kelleher found that while students developed similar programming concepts with both versions, the storytelling version increased engagement substantially with participants voluntarily spending significantly more time

with Storytelling Alice than the generic version, suggesting that the storytelling features can enhance motivation and engagement when engaged with Alice.

Scratch is another application designed for children between the ages of eight and 16 that allows people with little to no experience in computer programming to create and share digital stories and games with others (Resnick et al., 2009). Scratch and Storytelling Alice are among the few novice-friendly applications that allow children to use computer coding to create digital stories. While such programs are few in number, they have potential to promote computer coding skills through digital storytelling (Burke & Kafai, 2010; Kelleher, 2006; Resnick et al., 2009).

Burke and Kafai (2010) investigated the experiences of middle-school children who simultaneously developed programming and storytelling skills through designing digital stories with Scratch. The participants created storyboards to help themselves generate and organize ideas. They then transformed those stories into digital stories with Scratch. All of the participant's stories had at least a protagonist and antagonist, and 8 of 11 made use of multiple story settings/backgrounds. The researchers concluded that using stories, a concept the children were familiar with both from life experiences and school, was an effective medium to help students learn basic computer programming concepts and skills while also engaging in valuable storytelling processes.

While Burke and Kafai (2010) illustrate the potential of Scratch for fictional digital stories, Hutchison, Nadolny, and Estapa (2015) also see potential with Scratch Jr, a similar programming application designed to teach 5-7 year-old children computer coding skills through manipulating animated characters and settings. Students of different ages often have different storytelling habits and abilities (Peterson & McCabe, 1983), and

as Burke and Kafai (2010) have examined digital stories created with Scratch with middle-school children, investigating the digital stories created with Scratch Jr by children in the primary grades would fill a gap in the literature.

There are valuable educational possibilities for using Scratch Jr in literacy instruction. Hutchison, Nadolny, and Estapa (2015) illustrate various Scratch Jr activities that align with the Common Core State Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010), including reading, writing, speaking, and listening standards. This broad range of standards can be addressed because of the multimodal nature of Scratch Jr creations, which can include visual images and animations in conjunction with written and oral language. Thus, much potential exists for using Scratch Jr for literacy education. Furthermore, as Hutchison, Nadolny, and Estapa recognize that Scratch Jr activities can align with current Common Core standards, which are used in states throughout country, it can be helpful to interpret Scratch Jr activities through these standards to identify the ways that children engage in standards-based literacy practices through coding in Scratch Jr.

In addition to recognizing the potential of using Scratch Jr for literacy development, Hutchison, Nadolny, and Estapa (2015) also recognize that Scratch Jr can contribute to children's coding literacy skills, which they describe as the ability to utilize computer science and coding knowledge to create sequenced instructions for applications execute to accomplish a task. They believe that coding literacy is "an important type of digital and disciplinary literacy that is relevant to classroom instruction" (p. 494), an idea that complements the work of Shanahan and Shanahan (2014) who recognize that disciplinary literacy can play an important role in elementary education. Thus, using

coding applications such as Scratch Jr not only can contribute to literacy development, but also coding literacy and computer science knowledge and skills.

Scratch Jr is available on both iPads and Android tablets for free and allows students to create stories through selecting sprites (characters and objects), choosing a setting, and allowing the user to program the sprites to perform various actions, such as move across the screen, emit text bubbles, and play an audio recording of character dialogue. Additionally, users can program scene changes that correspond with character actions and the storyline. Overall, these possibilities represent rich opportunities for storytelling, as the user can combine images, animations, written text, and oral language.

Given that Scratch Jr has the potential to promote student literacy engagement and learning through creating digital stories, Scratch Jr represents a valuable application to investigate as it empowers young children to create digital, animated, and multimodal stories in ways previously not possible. Furthermore, as analyzing children's stories can illustrate important information about their learning and communicative abilities, conducting an analysis of children's digital stories with Scratch Jr may reveal valuable information related to their communication and storytelling preferences and abilities. This may not only highlight their current skills but also their areas for growth, both issues that could guide instruction in efforts to help children become more effective communicators and storytellers when working with digital technologies. Thus, analyzing the Scratch Jr-created digital stories of children is a contribution to the literature. While Scratch Jr creations can obviously be investigated from a computer coding or computer science perspective, as the present study focuses on children's digital and multimodal stories, the computer science perspective will be set aside so the study can focus deeply

on how children use Scratch Jr to create digital stories while examining the story elements and structures through a story grammar lens (Champion, McCabe, & Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013).

CHAPTER 3

METHODOLOGY

Overview

This chapter provides a description of the theoretical underpinnings of this study as well as its research methods and rationale. Additionally, this provide details on the research setting and participants and a detailed description of Scratch Jr, the coding app children utilized during the research procedures.

Theoretical Framework - New Literacies

Over the last two decades, scholars have reconceptualized literacy from its historic roots as the process of reading and writing to a significantly broader field of communicating through a variety of modes of communication that occur with different social contexts (Coiro, Knobel, Lankshear, & Leu, 2008; Gee, 2003; New London Group, 1996). This perspective permeates the field of literacy, which has become increasingly focused on digital and multimodal communication practices in which people, including students, both read/interpret and write/produce a variety of texts and products that allow them to make sense of and communicate with the world (Lankshear & Knobel, 2011).

This shift from written language to other forms of communication is noted in the work of various scholars. Kress (2003) noted that literacy has shifted to visual images from written words, and Kalantzis, Cope, and Cloonan (2010) recognize the existence and importance of multiple literacies, or multiliteracies, that involve communication through a variety of modes of communication.

Collectively these ideas can be grouped into a larger construct of new literacies (Coiro, Knobel, Lankshear, & Leu 2008; Lankshear & Knobel, 2011), which recognizes that emerging digital technologies create new literacy skills and experiences, and these experiences often include processes of interpreting and producing texts that include multiple modes of communication.

Furthermore, current educational standards, including the Common Core State Standards Initiative, recognize the importance of children both interpreting and producing multimodal texts using digital technologies (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). These standards align with and illustrate the importance of new literacy skills.

Thus, given the prominence of new literacies, both in literacy scholarship and current educational standards, this study will utilize the concept of new literacies as a theoretical framework that guided my interpretation, decision-making, and analysis processes. For example, this study does not conceive of writing as strictly limited to the process of producing written text. Rather, in line with the theoretical framing of new literacies, this study conceptualizes writing as a producing and organizing an array of multimodal symbols, including visual elements, written text, and oral language. Thus, this study recognizes how the children, through creating digital multimodal stories with the Scratch Jr application, engaged in new literacies practices that align with current literacy educational standards and utilized multimodal elements when producing a variety of story elements and structural patterns, which supported data analysis processes and are reflected in the results.

Rationale for a Mixed Methods Approach

Mixed methods research is a "class of research where the researcher mixes or combines quantitative and qualitative research techniques, methods, approaches, concepts, or language into a single study" (Johnson & Onwuegbuzie, 2004, p. 17). Mixed methods research approaches have gained popularity in recent years, largely influenced by its ability to combine the strengths of both quantitative and qualitative data (Creswell, 2012). Mixed methodologists strongly identify it as a pragmatic approach, as it is logical to use methods that are most likely to best answer the research questions (Maxcy, 2003; Teddlie & Tashakkori, 2003). In some instances, using both quantitative and qualitative research methods is the best approach to answering research questions, allowing researchers to collect and present both precise numerical data as well as contextual data capable of richly describing a phenomenon (Creswell, 2012; Johnson & Onwuegbuzie, 2004). The research questions developed for this study are best answered through using both quantitative and qualitative methods. The questions that will guide this research are:

1. How do children engage in literacy practices when using a multimedia coding app?
2. What types of story elements do first and second grade children produce using a multimedia coding app?
3. What types of structural patterns of narratives do the participants create when using Scratch Jr?

Answering these research questions with a mixed-methods approach illuminates how participants created stories with Scratch Jr. Additionally, the theoretical framework of new literacies was utilized when answering the research questions. In research

question one, the concept of literacy practices goes beyond associating literacy with the written word and utilizes a broader perspective of digital multimodal communication, which aligns with the perspective of new literacies (Coiro, Knobel, Lankshear, & Leu, 2008; Lankshear & Knobel, 2011). Furthermore, in relation to research questions two and three, narrative elements and structural patterns have traditionally been analyzed through examining children's oral language. However, the children in this study integrated multimodal communication in their stories (e.g., visual, written, and oral). Thus, research questions two and three were also impacted by the theoretical framework of new literacies, as story elements and structural patterns were conveyed through the children's use of visual, written, and oral modes of communication, which also aligns with a new literacies perspective.

While the data collection and analysis methods will be described in detail below, here is a brief overview. Research question one was answered primarily through the analysis of qualitative data, including observations, field notes, the tutors' story submission forms, and the children's digital stories. Research questions two and three were answered by collecting both quantitative data (i.e., numerical data obtained through analyzing the children's Scratch Jr stories with Peterson & McCabe's (1983) story grammar approach) as well as a qualitative unpacking of this numerical data to describe how the children utilized the story elements and structural patterns by examining specific examples from the children's stories. Overall, this study employed a mixed-methods approach as its research questions could be best answered by using both quantitative and qualitative data, which is recognized by scholars as a primary reason for using a mixed-

methods approach (Creswell, 2012; Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2003).

Setting and Participants

This research was conducted at a university reading clinic, a tutoring program in which preservice teachers tutor children from the community to promote literacy development. This clinic serves multiple purposes. It is designed to provide preservice teachers an opportunity to tutor children in literacy activities while receiving supervision and guidance from university faculty and instructors, which helps the preservice teachers hone their teaching skills and develop experience providing literacy interventions for children. Additionally, the reading clinic helps culturally and linguistically diverse children develop their literacy skills that contribute to school success. Finally, through this work, the reading clinic provides an opportunity for the university to serve the community, which aligns with the university's land grant mission.

The children who attend the clinic come from culturally and linguistically diverse backgrounds. Many of the children attending the clinic have parents who were not born in the United States, and their parents enroll them not only to promote literacy development but also English language abilities, as English is often not spoken in the home. Other students are native English speakers whose literacy abilities vary significantly compared to grade level. Overall, the university reading clinic serves a diverse group of K-12 students whose parents have enrolled them into the reading clinic for a variety of reasons.

While the reading clinic serves students of a wide age range, this study included four first-grade children and four second-grade children. First- and second-grade children

were included in this study as Scratch Jr was designed for children aged five to seven. The eight children who participated in this study varied in their literacy skills, though most of them were reading close to grade level. Additionally, the children come from diverse cultural backgrounds, and seven of the eight children are English learners. Of the four first-grade children, there were two boys and two girls, and of the four second-grade children, there was one boy and three girls. I obtained written consent from these eight children's parents (see Appendix A) as well as verbal assent from the children themselves in line with the IRB approval (see Appendix B).

The tutors were all females near the end of their teacher licensure program in either elementary education or early childhood education. Their roles as tutors were connected to two university courses related to literacy tutoring and assessment, which are required for students who are earning their reading endorsement. The tutors' participation and roles within the research is described next.

Introduction of Scratch Jr to Tutors

All of the tutors attended a presentation in which I provided an overview of the study as well introduced Scratch Jr and described its potential for literacy instruction. This presentation lasted approximately one hour, including a 10-minute overview of the study and the tutors' roles within the study, a 5-minute overview of the potential value of using Scratch Jr in literacy instruction in the primary grades, a 10-minute demonstration of Scratch Jr features, and a 35-minute period for the tutors to use and familiarize themselves with the application as the I provided guidance and feedback. They learned about the different features of Scratch Jr as well as ways children can use these features to create fictional multimodal stories. Finally, the tutors received instructions (both verbal

and written) for how they are to introduce the Scratch Jr application to the children (see Appendix C for Teacher Directions and Appendix D for Scratch Jr Story Submission Form).

Overview of Tutor Support in the Children's Story Creation

During the Scratch Jr sessions, the children were instructed to create their own fictional stories. Tutors reminded the students that they can create any type of story they want, which could include singular or multiple characters, singular or multiple settings, and any type and amount of written or oral language. The purpose of this approach was to determine what story elements and patterns children use with Scratch Jr when they have the choice of open-ended opportunities.

While the characters, actions, setting, plot, and content were decided by the children, there were a few primary areas where tutors provided support (see Appendix C), which are succinctly addressed here and then in more depth below:

1. Tutors asked prompting questions related to the story, characters, actions, setting, and plot.
2. Tutors provided technical support for Scratch Jr general functionality and programming features.
3. Tutors took dictations from the children and entered their words/sentences into Scratch Jr.

Characters, actions, and settings are the most basic choices Scratch Jr users have. Each new creation opens with a default character, an orange cat, which the user can either keep or change. Additionally, as the default orange cat appears, the user interface shows the coding blocks that users can connect to make the character perform certain actions,

such as moving and speaking. Making characters perform actions through coding is a fundamental part of this program, and the tutor asking their students what they want their character(s) to do through coding was a way to support a student in using this program. Finally, the default background/setting is a blank white screen. Tutors often asked their students what they wanted to choose for their background. Thus, given the fundamental features of characters, actions, and settings, there are three primary questions that teachers may ask their students:

1. What character(s) do you want to use?
2. What do you want your character(s) to do?
3. What do you want as your background?

These three questions, which correspond with three primary features of Scratch Jr creations, were listed on the tutor's instructions (see Appendix C) along with the broad initial question of "What do you want your story to be about?", which was included to elicit the student's thinking about story creation. Tutors also asked similar general probing questions, yet they were instructed to not make suggestions about characters, settings, actions, plots, or dialogue. This was clearly illustrated on their instruction sheets. As the teachers asked probing questions, they also took notes on their use of probing questions on the Story Submission Form to document the questions and types of questions they asked (see Appendix D).

While these questions influenced student's creations, they represent basic features of both stories and the Scratch Jr application. These open-ended probing questions encouraged students to use these fundamental features of Scratch Jr to create a story. Given that there are dozens of characters and settings to choose from, as well as a nearly

endless array of possible combinations of character actions and written and verbal dialogue, the children's Scratch Jr stories varied greatly. The stories varied in both content and complexity, which was impacted by student choice, interest, ability and creativity.

Beyond the general probing questions listed above, the second form of tutor support relates to how they provided assistance with the programming features, as some features can be difficult to understand and use. This did not include suggesting actions or programming features, but was aimed to help the children realize their visions, which involved actions like connecting coding tiles to make them function in a specifically desired way and using if/then messages to initiate certain actions. Thus, in this way, the tutors provided coding/technical support to help students bring their ideas to life, and I set the expectation that the tutors did not suggest specific actions or coding functions. The teachers took notes on their technical support on the story submission forms (Appendix D).

Finally, the last primary form of teacher support related to taking dictations and spelling written words. Teachers provided support with spelling words, so that students could focus on creating the text and story, rather than limiting themselves to only using words they know how to spell. This occurred through the children, who after indicating they wanted to use writing in their story, dictated their desired messages to the tutor, who then wrote the child's words/sentence into Scratch Jr. Given this, teachers will be explicitly instructed verbally and through the teacher's instructions sheet (Appendix C) to not provide suggestion for dialogue. Their role was to take the child's dictation and enter it as written text into the program; they were not to suggest dialogue. The tutors took

notes on the dictation/written text support they provided on the Story Submission Form (Appendix D). While in most instances the tutors stuck to this protocol, there were a few occasions in which the children firmly insisted that they type the written text themselves, which the tutors allowed.

Ultimately, while tutors provided support through asking general probing questions, helping with technical issues, and taking dictations and entering the written text, the children were responsible for the choices related to content (e.g., characters, settings, actions, plot, dialogue, etc.). This was made explicitly clear to the teachers both in the session that prepared and introduced them to the study and Scratch Jr. I also made this clear in their instructions sheets to which they occasionally referred to while facilitating the Scratch Jr activities.

Data Collection

Data were collected at a university reading clinic. Of the eight participating children, seven had two tutors while one (a first-grade girl) had just one tutor. Data collection was divided into four days: an introduction day and three days in which the children created digital stories with Scratch Jr. During the introduction day, I gave a brief verbal overview of how the children could create stories with Scratch Jr, then I adhered to the following schedule (see video links in Appendix C).

- 3-minute demo video on overview of basic functions of Scratch Jr
- 5-minute session where children use and play with Scratch Jr
- 3-minute demo video on using additional functions including oral and written language
- 5-minute session where children use and play with Scratch Jr

- 5-minute demo video on advanced functions (e.g., connecting multiple scenes and using envelopes that initiate additional actions)
- 5-minute session where children use and play with Scratch Jr

While the children explored the application and its features, the tutors provided general support when the children struggled to use a feature of the application. The tutors also took notes on the story submission forms about how the children interacted with the application as well as which types of support they provided to the children. During the introduction day, I observed and took field notes on how the children created stories with Scratch Jr by circling around the room, observing the children's behaviors, and taking notes when I noticed an event that was interesting and related to the research questions. In line with established qualitative methodological approaches, my field notes consisted of the descriptions of the setting as well as the participants and their actions as well as reflective components that allowed me, as the research, to record my interpretations and reactions of the activity as relates to the research questions (Creswell, 2008; Merriam, 2009). While I observed and took field notes, occasionally a child or tutor would call me over and ask me for advice on how to use a particular function of the program. In a few instances, children called me over to show me their work. Overall, for the introduction day, data collected was of three types: field notes, observations, and the tutors' story submission forms.

The data collection process was different for the three days in which children created stories with Scratch Jr. On the first story creation day, the children were told they had thirty minutes to create any type of story they wanted and that the tutors were there for support, and the children and tutors were given a five-minute and a one-minute notice

as time was concluding. If the children were not completely done with their story within the 30 minutes, they briefly made final adjustments before finalizing their story.

The children each received their own iPad and began working on their stories. Initially, as the children began using Scratch Jr, tutors asked a general prompting question, such as "What do you want your story to be about?" This helped the children think about their desired story and its features, which guided them as they began creating with Scratch Jr. Sometimes the children had difficulty generating ideas for their story, which the tutors often responded to by asking additional questions to help the child progress. Overall, the tutors asked prompting questions to get the student thinking about his or her story as well as to learn about their student's plans. (See tutor directions and prompting questions in Appendix C).

The tutors took notes about their children's stories, the creation process, and the support they provided to the children. During this time, I observed and took field notes, and occasionally, a tutor requested that I tell or show them how to use a certain function, such as how to use if/then coding blocks. After the children had created their stories, the tutors emailed me a copy of the story filed through the Scratch Jr app. They also completed and submitted their story submission forms, which included basic information, such as the child's and tutor's names, as well as tutor notes on support provided and the child's engagement and disposition during the activity. In sum, on the first story creation day the data collected included tutors' story submission forms and the children's stories as well as field notes and observations.

On the second and third story creation days, the process was slightly different. In addition to the process and all of the forms of data collected that were described in the

previous paragraph, the children and tutors also engaged in a prewriting process, which then guided the children as they created their stories. I included the prewriting process for the following reasons. First, through my observations and field notes on the first day, I noticed that many of the children's stories were disjointed and that some tutors seemed to question the value of the children creating such disjointed stories. Additionally, one child's tutors specifically asked if they could engage in a prewriting activity with their student during the subsequent session as it would help him focus and create more of a cohesive story. So, in order to try to make the tutors more comfortable and potentially help their students focus, I decided to have the tutors and children engage in a prewriting session before creating the second and third stories, a change I cleared with the committee in advance of implementing. This change is similar to approaches in design-based research (Reinking & Bradley, 2008), which recognizes that researchers can alter their program after learning about the experiences of students and educators in order to enhance instructional practices. Thus, in order to provide a better learning experience for the students and tutors, this study drew from design-based research (Reinking & Bradley, 2008) and modified the procedures by including a prewriting activity that would enhance the experience of both children and tutors.

During this prewriting time, which lasted about five minutes, the tutors and children discussed story-related topics such as characters, setting, plot, and events. Many of the children and tutors created a graphic organizer in which they described ideas for these categories. After their prewriting session, the children began creating their stories, and they and their tutors would often refer back to the ideas and graphic organizer from prewriting to help them focus on the story they envisioned during prewriting. In sum, for

the second and third story creation days, the data collected included the children's stories, the tutors' story submission forms, and graphic organizers created during prewriting as well as my field notes and observations.

Overall, in terms of data collection, all of the forms described of data collection align with the qualitative data types described by Creswell (2013). The primary data collection activities, include research observations and field notes as well as the collection of documents (i.e., the Scratch Jr Story Submission Forms, see Appendix D) and audio-visual materials (i.e., the Scratch Jr stories).

This section has illustrated the various forms of data and methods for collection including observations, field notes, audio-visuals (the Scratch Jr stories), and documents (the teachers' notes on student engagement and support as well as the prewriting graphic organizers). After all of these data were collected, the data were analyzed to answer the research questions. The methods for analysis are presented below.

Data Analysis

As noted at the beginning of the chapter, this research utilized a mixed-methods research approach as it is pragmatic as it uses the both quantitative and qualitative methods to best answer the research questions (Johnson & Onwuegbuzie, 2004; Teddlie & Tashakkori, 2003). Creswell (2012) notes that there are different types of mixed methods designs, which vary in their sequence and emphasis in quantitative and qualitative data collection and analysis. In this study, different research questions will be addressed through different research approaches (see Table 1 for overview). While the first research question was examined using only qualitative data, the second and third research questions utilized both quantitative and qualitative data in an embedded mixed-

methods design (Creswell, 2012) in which qualitative descriptions support numerical patterns and findings to provide a more holistic picture of the stories, their elements, and their structural patterns. The data analysis procedures are illustrated in further detail below.

As Table 1 illustrates, research question one was analyzed using solely qualitative methods. An interpretive approach, which seeks to describe and understand an issue from the researcher's perspective, guided the analysis of the data in this research question (Merriam, 2009). In line with this interpretive approach, for example, I, as the researcher, made decisions about what to observe, how to interpret what I saw, and what to write down as field notes. Overall, for research question one, the data includes observations, field notes, documents (story submission forms and prewriting graphic organizers), and audio-visual materials (the Scratch Jr stories), which align with Creswell's (2012) forms of qualitative data.

In order to assess how children engage in literacy practices when using a multimedia coding application, I examined current educational standards to identify which standards potentially aligned with the children's story creation processes that could guide the analysis for this research question, which resulted in three Common Core State Standards being identified for each grade, including two writing standards and one speaking and listening standard. Common Core Literacy Standards were chosen given their nationwide prominence and influence in education. Furthermore, as the standards were designed to highlight valuable literacy processes, I felt they would be useful for analyzing how the children engaged in literacy practices. The three standards for first grade correspond to the same standards for second grade (i.e., the first-grade standards

are essentially simpler versions of the same standards at the second-grade level). I selected these standards based on my experiences with Scratch Jr and observing the children create stories on the platform, a process that certainly aligns with some standards better than others. I felt these particular standards highlight valuable literacy practices that align with children's story creation processes with Scratch Jr. These standards are listed below (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010).

After selecting these standards, they served as a reference point for my analysis and drove my coding procedures. I began by coding the data, which is the process of identifying potentially valuable segments of data that help answer the research questions (Merriam, 2009).

For each standard, I examined the data for instances of how the children's behavior aligned or failed to align with these standards. I validated the codes through triangulation, in which I corroborated evidence through examining and comparing the multiple data sources (Creswell, 2014). Finally, I created a detailed description that demonstrates how the children engaged or failed to engage in various standards-based literacy practices by richly describing their behaviors while creating the Scratch Jr stories as well as presenting their final products.

Table 1

Overview of Research Questions, Data Forms, and Data Analysis

Research Question	Forms of Data	Data Analysis
1) How do children engage in literacy practices when using a multimedia coding app?	**Quantitative** N/A **Qualitative** Observations Field Notes Documents (story submission forms from teachers and prewriting graphic organizers) Audio-visuals (Scratch Jr Stories)	Quantitative data will not be collected for this research question Qualitative data were coded through identifying valuable information that helped answer and illuminate the research question.
2) What types of narratives elements do first- and second-grade children produce using Scratch Jr?	**Quantitative** Numerical counts of the different story elements in Scratch Jr stories **Qualitative** Scratch Jr stories	Numerical counts of the different story elements were examined to determine the frequency of story elements in the children's stories as well as how the children utilized the story elements through different modes of communication (e.g., visual, written, and oral). Qualitative descriptions supplemented the quantitative patterns to illustrate not only the frequency of elements but also provide a nuanced account of how children used various story elements.
3) What types of structural patterns of narratives do the participants create when using Scratch Jr?	**Quantitative** Numerical counts of structural patterns in Scratch Jr stories **Qualitative** Scratch Jr stories	Numerical counts of the different structural patterns were examined to determine their frequency. Qualitative descriptions supplemented the quantitative patterns to illustrate not only the frequency of structural patterns but also to provide a nuanced account of how children used different structural patterns.

First-grade standards

- Writing standards
    - CCSS.ELA-LITERACY.W.1.3
        - Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.
    - CCSS.ELA-LITERACY.W.1.5
        - With guidance and support from adults, focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed.
- Speaking and Listening Standard
    - CCSS.ELA-LITERACY.SL.1.5
        - Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

Second-grade standards

- Writing Standards
    - CCSS.ELA-LITERACY.W.2.3
        - Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.
    - CCSS.ELA-LITERACY.W.2.5

        - With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.
- Speaking and Listening Standard
    - CCSS.ELA-LITERACY.SL.2.5
        - Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

Story grammar analysis

The second and third research questions, which relate to the types of story elements, structural patterns, and communicative modes present in the children's stories, utilized a story grammar approach to analyzing the children's stories (Champion, McCabe, & Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013). While other approaches to analyzing narratives exist, after examining the literature, the story grammar approach was identified as best-suited to answer the research questions related to children's Scratch Jr stories. While Labov's (1972) approach and its derivative high-point analysis (McCabe & Bliss, 2003) could have been used, these both place high emphasis on the storyteller's evaluative statements (i.e., their personal thoughts and reflections on the story), which would not have worked well for Scratch Jr fictional stories that often lack evaluative statements from the storyteller. Additionally, while Bliss, McCabe, and Miranda (1998) created the Narrative Assessment Profile, this profile does not examine story elements, which was an integral component of this study.

After reviewing various approaches to analyzing children's stories, I decided to analyze the Scratch Jr stories using a story grammar approach (Champion, McCabe, &

Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013). More specifically, this study drew from Peterson and McCabe's (1983) episodic story grammar approach, as it is described in detail, which aided in the analysis process.

Story grammar has been used for decades as a way of analyzing and interpreting the story elements and structural patterns of children's stories (Champion, McCabe, & Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013). In order to determine the applicability of this methodology, I examined existing children's Scratch Jr stories, which I had access to through my past experiences of working with children on Scratch Jr, and identified that they contain various story elements and structural patterns aligned with story grammar. I then contacted Dr. McCabe through email, who agreed that starting with the episodic story grammar approach was a good idea and that I would also need to develop a coding system to identify how the multimodal elements function in the story (McCabe, personal communication, July 5, 2016). She mentioned the coding of pictures specifically, but as the stories can also include written and oral language, codes for identifying these also needed to be developed. The overall coding system combined episodic story grammar (Peterson & McCabe, 1983) with codes that identified how different modes of communication contributed to the story.

Visual, written, and oral forms of communication were focused on in this study for a few reasons. First, these forms of communication are all noted as valuable in the first- and second-grade Common Core Literacy Standards. Second, these modes of communication are central affordances of storytelling with Scratch Jr, and finally, visual, written, and oral modes are recognized as valuable by literacy scholars as valuable forms of communication (Kalantzis, Cope, and Cloonan, 2010; Hutchison & Colwell, 2015).

Thus, I will focus on these three modes during data analysis. The overall system for analysis is described next in detail.

The story grammar approach assumes that stories have patterns and organized structures, many of which have protagonists who act in an attempt to achieve goals, and elements of these stories can be broken down by the function they serve in the story (Peterson & McCabe, 1983). Thus, statements, or communicative modes (e.g., visual, oral, and written forms of communication) in the case of this research, were classified to develop an understanding of how different multimodal features represent different story elements, which combine to create the overall story. The Scratch Jr creations were analyzed for how they align with the patterns of narrative structures identified by (Peterson & McCabe, 1983). Peterson and McCabe (1983) build on the work of Stein and Glenn (1979) and use their framework for classifying statements into the following types of narrative functions:

- "**Events** are defined as natural occurrences, actions, or environmental states resulting from actions."
- "**Motivating states** are internal states, such as affects, cognitions, or goals, that motivate the protagonist."
- "**Attempts** are actions initiated by an event or a motivating state and are preparatory to goal-attainment."
- "**Consequences** are actions that directly achieve or fail to achieve a goal, or existing states once all attempts have failed."

- "**Reactions** are either internal states that are precipitated by events, attempts, or consequences and do not motivate behavior, or they are purposeless actions that are precipitated by events, attempts, or consequences"
- "**Settings** are internal states, external states, or habitual actions that serve to introduce the characters and the social and physical environment"
- "**Judgments** are statements in which the child steps out of the time frame of the narrative and comments on the narrated events" (Peterson & McCabe, 1983, p. 69)
- **Appendages** include "narrative comments that are attached to either the beginning or the end of the main body of the narrative. They are superfluous niceties of narration, and are of four types:
    - "**Abstracts** - Summaries of the narrative that occur at the beginning"
    - "**Attention-Getters** - Explicit bids for listener attention"
    - "**Prologues** - Statements of the ending or lasting significance of a narrative, occurring at the beginning"
    - "**Codas** - formalized endings of a narrative" (Peterson & McCabe, 1983, p. 33)

I analyzed the children's Scratch Jr stories based on this framework for classification. As described by Peterson & McCabe (1983), the functional categories listed above are used for most structural patterns of narratives (the ones that include causality), and the structural patterns associated with these functional story elements were classified as a particular type of sequence and episode. However, there are two types of narratives that lack causality: descriptive sequences and action sequences. Peterson and

McCabe note that the statements within these types of narratives do not serve a function, but rather they present content. So, children's stories that were identified as lacking causality were determined to be descriptive or action sequences and were coded not with the functional categories listed above, but with the content categories listed here:

- "**Actions** are the behaviors of the characters"
- "**External states** are descriptions of the story environment"
- "**Internal states** are descriptions of a character's internal states, such as likes and dislikes, personality traits, and habitual feelings."
- "**Natural occurrences** are changes in the environment" (p. 70).

As Peterson and McCabe (1983) noted, when analyzing children's narratives, identifying the content and functional categories can help the researchers understand the story elements and structural patterns of those stories. Peterson and McCabe worked exclusively with personal oral narratives of children, and this study examines fictional, digital stories with multimodal elements. Because of these differences, this study adjusted Peterson and McCabe's story grammar approach to story grammar analysis in two ways.

First, to recognize the contributions of multimodal elements, each story element was not only identified and categorized, as was the approach by Peterson and McCabe, but each element will also be counted and tagged by the mode of communication (visual, written, and oral) through which it was presented. For example, the story element of events could be conveyed visually (e.g., a character's movement), through writing (e.g., a speech bubble with written text), or via oral language (e.g., through an audio recording of the child's voice).

Second, in the work of Peterson and McCabe, children narrated their own personal stories, and thus, their stories were told from their own point of view. However, in this study with its focus on fictional stories, the children created the stories through the point of view of an independent author. This is an important distinction. When Peterson and McCabe analyzed children's narratives, they analyzed the narratives from the child's perspective (i.e., story elements were identified by how they relate to the child telling the narrative, including which phrases represented events, motivating states, attempts, etc. from the child's perspective). However, given that the children who participated in this study, in their authorial position, created their stories from the neutral perspective of an author of fiction, I could not analyze the story elements from the child's perspective. However, we can still analyze the story elements from the perspective of the third-party audience, which revealed the story elements and structural patterns used when children tell fictional digital stories.

Given these two differences, in this study, story grammar analysis will be conducted as follows. Each story element (e.g., event, setting, motivating state, etc.) was identified and categorized from the perspective of the audience (i.e., what is communicated to the audience as an event, setting, etc.), a process that still uses the story grammar classification guidelines of Peterson and McCabe (1983). Additionally, each story element will be identified, counted, and tagged with a description of how it was presented (e.g., visually, orally, or through written text). Table 2 presents a few examples of how story elements were identified and tagged with a mode of communication:

Table 2

Examples of Feature Classification

Feature Created/Selected by Child	Story Element	Mode of Communication
Background images (e.g., a classroom, forest, or beach)	Setting	Visual
Character walking across the screen to accomplish goal	Attempt	Visual
Character's written text bubble saying "I want to find treasure"	Motivating State	Written
Cat character says, "Yes, let's play" through an audio recording after a dog character asks if the cat if it wants to play	Reaction	Oral

Each of the story elements were identified, categorized, counted, and tagged with information that illustrates how that element was communicated (visually, orally, or through written language). Analyses of sample Scratch Jr stories are available in Appendix E.

In addition to recognizing the story elements and how they are communicated through multimodal symbols, it is also important to recognize how these elements combine to create structural patterns (Peterson & McCabe, 1983, p. 71), such as the following:

- **Descriptive Sequences** - "Describe character(s), surroundings, and habitual actions with no causal relationships"
- **Action Sequence** - "A list of actions that are chronologically rather than causally ordered"
- **Reactive Sequence** - "A set of changes that automatically cause other changes with no planning involved"
- **Abbreviated Episode** - "Describes aims of a protagonist, but planning generally must be inferred"

- **Complete Episode** - "Also describes aims but exhibits more evidence of planning"
- **Incomplete Episode** - "Gives all components of a complete, complex, or interactive episode except the requisite consequence"
- **Complex Episode** - "An elaboration of a complete episode in one of four ways"
    - "By an embedded reactive sequence"
    - "By an embedded complete episode"
    - "By a multiple plan application (i.e., repeated attempts)
    - "By a multiple plan application with an embedded complete episode"
- **Interactive Episode** - "Describes one set of events from two perspectives, where both people have goals and influence each other. There are two primitive variants of this pattern that involve interchange between characters, although they are not truly interactive":
    - "A shifting-perspective narrative describes contiguous, not coextensive, events from alternative perspectives"
    - "An interactive reactive sequence describes extensive interactions with no evidence of planning"

I identified, categorized, and counted the frequency of various story elements and structural patterns, as well as tagged the elements with the mode of communication. Through this process, I identified the numerical frequency of story elements and the modes through which they were conveyed as well as the structural patterns for each grade. This quantitative data were used to analyze and illuminate patterns of how the

children used different modes of communication to produce a variety of story elements and structural patterns in their Scratch Jr stories.

After determining the frequency of the story elements, the communicative modes through which they were conveyed, and the structural patterns, I examined this data for patterns to determine which types of story elements, communicative modes, and structural patterns were common and which ones were uncommon and absent. Next, I provided qualitative descriptions of how the children used these different features by connecting specific examples of their stories, including both screenshots and video recordings of the stories, to the defining criteria of the story elements and structural patterns. Additionally, story elements were examined and presented to illustrate how children conveyed these elements through various communicative modes (visual, written, and oral) by providing descriptive examples (supplemented by screenshots and video recordings of the story) of each type of communication that the children used to convey that story element.

As noted previously, research questions two and three used an embedded mixed-method approach, in which qualitative descriptions will supplement the quantitative data (Creswell, 2012). In this research, the quantitative data were the numerical frequency of the story elements, structural patterns, and communicative modes used to convey story elements, which was enhanced by qualitative and descriptive examples of these features. For example, for research question two, examining the story elements used by children was not only addressed with the quantitative data, but I also provided detailed descriptions of how the children used the story elements through including screenshots and videos of their stories along with descriptions of how the elements were used in a

particular story, as well as describe patterns of how children used story elements more generally across the dataset. This approach was also used for the third research question, allowing quantitative data (e.g., the frequency of structural patterns) to be supplemented through rich qualitative descriptions, presenting the data in more holistic fashion that aligns with an embedded mixed-methods approach (Creswell, 2012).

Conclusion to Methodology

The three research questions in this study were answered through collecting and analyzing both quantitative and qualitative data. The first research question will be answered through qualitative data including observations, field notes, documents (e.g., story submission forms and prewriting graphic organizers), and audio-visuals (the Scratch Jr stories), which align with Creswell's (2012) forms of qualitative data. I answered the second and third research questions by using an embedded mixed-method approach in which the quantitative data were supplemented by qualitative descriptions of the phenomena of analysis (e.g., story elements and structural patterns). Using this overall approach was a pragmatic way of effectively investigating the research questions for this study.

CHAPTER 4

RESULTS

Overview

Communicating through digital technologies is a critical feature in modern education (International Reading Association, 2009; Lankshear & Knobel, 2011). Developing digital communication skills is valuable for school children and aligns with current educational literacy standards. Thus, this study examined how young children create digital stories via a computer coding application on iPads. This chapter describes the findings of this research study. As outlined in the methodology chapter, there are three research questions that drove the methods, data collection, and analysis procedures for this study. The results for each of the three research questions are presented below.

Research Question 1:

How Do Children Engage in Literacy Practices When Using a Multimedia Coding App?

Overview

In order to assess how children engaged in literacy practices when using a multimedia coding application, current educational standards were examined to identify which standards potentially aligned with the children's story creation processes, which resulted in three Common Core State Standards being identified for each grade, including two writing standards and one speaking and listening standard. The three standards for first grade correspond to the same standards for second grade, meaning that the first-grade standards are essentially simpler versions of the same standards at the second-grade

level. (Note: all of the standards are presented in Chapter 3 and can be reviewed to illustrate commonalities between corresponding first- and second-grade standards.)

As indicated in the methodology chapter, I identified three current educational literacy standards for each grade from the Common Core State Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010) that served as a guide for analysis. These standards will be examined below to illustrate the ways that participants engaged or did not engage in these standards during their story creation processes. As each first-grade standard corresponds with a specific second grade standard, a first-grade standard will be compared to the work of the first-grade children initially, which will be followed by a similar presentation of the corresponding second-grade standard. The following results were obtained by examining and cross-referencing the children's digital stories and the tutors' story submission forms along with field notes and observations. Data analysis included examination of patterns in the children's experiences creating stories with Scratch Jr that are relevant to the standards being examined.

As was discussed in previous chapters, this study utilizes the concept of new literacies (Coiro, Knobel, Lankshear, & Leu, 2008; Lankshear & Knobel, 2011) as a theoretical framework. In line with the perspective and importance of new literacies, the Common Core State Standards recognize the importance of writing and communicating through digital and multimodal means, and this study aims to develop an understanding of how the children utilize new literacies through creating digital multimodal stories with Scratch Jr. In this study the concept of writing is conceptualized broadly in ways that go beyond the written language, in line with the perspective of new literacies, and examines

how the children authored digital multimodal stories. When examining how the children's digital story creation processes aligned with core writing standards, I conceptualized writing as the production and organization of multimodal symbols more broadly, as opposed to conceptualizing writing as limited to the production of written text. The sections below illustrate how the children demonstrated their abilities to engage in practices consistent with current educational standards through creating digital stories with their tutors. Each standard will be examined in turn.

Writing standard - CCSS.ELA-LITERACY.W.1.3

- Write narratives in which they recount two or more appropriately sequenced events, include some details regarding what happened, use temporal words to signal event order, and provide some sense of closure.

In order to recognize how the work of the children compares to this standard, each of the four first-grade children's digital stories was examined for the following categories: sequenced events, details, temporal words/signifiers, and sense of closure. Examples of how the children's work corresponds with these categories are presented below.

Sequenced events. The first-grade children created sequenced events in three primary ways. First, they sequenced computer coding blocks knowing that Scratch Jr executes these blocks from left to right. Second, the children utilized if/then coding blocks (colored envelopes), which allowed them to sequence events by programming some events to occur before others. Third, children used scene changing coding (red blocks with an image of the subsequent scene) that allowed them to program certain

scenes and events to occur before or after others, allowing them to sequence events in specific orders that help facilitate their stories.

All of these three approaches to sequencing events are represented in *Tac and the Fairy*, a story by a first-grade girl, Sara (see Figure 2). First, as Scratch Jr is a computer coding application, computer programs function by running a sequence of codes, in which the programmer chooses for one set of codes to be executed before another set. For example, in the first scene, Sara programmed the first event to be the movement of the ball, which she coded to go back and forth between characters. After these movement codes are sequentially executed, the program triggers an if/then statement via an envelope, and if/then statements represent another way the children sequenced events. As were Sara's intentions for sequencing events, when Scratch Jr processes the orange envelope, it signals the green alien to say "That was fun" in a text bubble; after this event occurs, the purple alien says "That was really fun", which is triggered by another if/then envelope. Finally, Sara wanted the story to move to a new scene, which she programmed by using the red change-scene coding block. Children used all three of these methods for sequencing events including character movement and dialogue, demonstrating their proficiency for sequencing events.

Details. The children's stories used visual, written, and oral modes of communication to illustrate details related to the characters' actions and the story environment. The corresponding second-grade standard uses more the specific terms related to the use of "details to describe actions, thoughts, and feelings." These concepts will be examined here to focus on what standards consider to be valuable details.

Figure 2. *Tac and the Fairy* by Sara

Details related to actions were of two primary types: visual movements and character dialogue, including both written and oral communication. Examples of both of these can be found in Sara's story, *Tac and the Fairy* (see Figure 2). Visual movements include the ball bouncing back and forth between characters in the first scene and the fairy's movements in both the second and third scene. Additionally, in the first and second scenes, the child programmed the characters to speak through written text bubbles, and in the final scene, the fairy makes a yawning sound through an audio recording of the child's voice. These are all examples of how the child used actions to describe details of the story.

In addition to using actions, Sara used details to describe the thoughts and feelings of characters in her story. For example, in the first scene, Sara programmed her characters to comment on how they thought it was fun to pass the ball through written

text bubbles, and in the final scene she programmed the fairy to produce a yawning sound, which was a recording of her own voice yawning, an act indicative of how the fairy was feeling tired.

In addition to details related to actions, thoughts, and feelings, details in oral stories often describe the characters and their environments, which are obviously conveyed through oral language. However, in the children's multimodal stories in this study, these types of details were conveyed primarily through the visual mode of communication. For example, in *Tac and the Fairy*, the details about the characters and environment are conveyed visually. The audience can see what the characters and environment look like; thus, it is not necessary for Sara to use writing to say that "on a moon with rocks and craters, a purple alien passed a striped ball back and forth with a green alien." Similarly, in the final scene of this story, there is no need to use detail words to describe the bedroom and the items within, as all of this information is conveyed visually. Generally speaking, the visual elements in the children's stories conveyed a wealth of information about their stories characters, objects, and environments, more than one would likely convey through language, and the availability of visuals and their ability to convey details made using language to convey details about the appearances of the characters, objects, and environments unnecessary.

Temporal words/signifiers. Similar to how children used visual elements to convey details about the story, they also used visuals to signal order of events. Thus, temporal words were essentially absent in the children stories, as they used visuals to demonstrate temporality and the sequence of events instead. Examples of this are illustrated in Elle's story, Fun Scratch Jr (see Figure 3). Elle's programmed her to story to

contain sequenced dialogue and multiple shifts in settings that signify temporally which events occur before and after others. For example, after Elle programmed the children to identify that they do not have swim suits, she used a red scene-change coding block to shift the setting to the bedroom, signifying temporally that the bedroom scene occurs after the initial beach scene. Additionally, in the bedroom scene, the younger girl says "Let's get our swimming suits" and then the older girl says "Okay", which is followed by the two girls moving around the room, as if looking for the swimsuits. Finally, the older girl says "I found them", the scene shifts back to the beach, and the older girl says "We are ready." There are no temporal words in this story, and they are not necessary, because Elle used visual means to convey temporality. She programmed one text bubble to occur before another and sequenced scene-changes through using coding blocks that illustrate how events in one setting occur before events in a subsequent setting.

Figure 3. *Fun Scratch Jr* by Elle, Example 1

Sense of closure. Of all of the components of this literacy standard, a sense of closure was certainly the least frequent. However, Elle's story, *Fun Scratch Jr*, contained a sense of closure. Elle programmed her characters to identify a problem, which was that they did not have swimsuits, and then the characters aimed to resolve that problem by going to the bedroom and finding their swimsuits. Afterwards, they went back to the beach and said "We are ready", indicating they were finally ready to play at the beach. Another first-grade girl named Sara created a story, *Polar Bear and the Penguin* (see Figure 4), which contained a sense of closure. In Sara's story (see Figure 2), after she programmed her characters to execute various actions and dialogue, one of the characters said "Good Night" to the other and then they both disappeared, signaling that the story was over.

Figure 4. *Polar Bear and the Penguin* by Sara

However, most of the first-grade children's stories lacked a sense of closure, which may have occurred because it was something the children did not care about or it may be related to how several of the stories appeared to be unfinished because they ran out of time. For example, Tommy's story, *Tacky Land and Tacky* (see Figure 5), Tommy created a second scene that contains a main character, but this character has no actions in this new scene, possibly indicating that the child wanted to create more events or finish the story but ran out of time. Tommy created another story, *Crabby and His Friends* (see Figure 6), and it appears he also ran out of time in this story. In addition, the presence of a final scene without any character actions, and his brainstorming sheet also indicated that the starfish and fish would save the crab, but this was not reflected in his story.

Figure 5. *Tacky Land and Tacky* by Tommy

Figure 6. *Crabby and His Friends* by Tommy

Addressing all components. While all of the children's stories contained sequenced events, story details and temporal signifiers, very few stories had a sense of closure. Thus, while all children engaged in a variety of literacy processes that this standard identifies as important, there was a lack of closure in most stories, which was likely influenced both by the types of stories children wanted to create and how it appears that some children ran out of time and did not realize their entire vision for the story, as indicated above. While only a few stories had a sense of closure, all stories illustrated how children sequenced events, contained details, and used visuals to illustrate temporality, which illustrates how children are engaging in actions that this standard identifies as valuable literacy practices for first-grade children.

Writing standard - CCSS.ELA-LITERACY.W.2.3

- Write narratives in which they recount a well-elaborated event or short sequence of events, include details to describe actions, thoughts, and feelings, use temporal words to signal event order, and provide a sense of closure.

This literacy standard is similar to its corresponding first-grade standard, which was just examined. Similar to how the first-grade standard was divided into four components for analysis (sequence of events, details, temporal words/signifiers, and sense of closure), this second-grade standard will be examined in the same way to illustrate how second-grade children engaged in standards-related literacy practices while creating their Scratch Jr stories.

Sequenced events. Second grade children sequenced events in the same three primary ways as their first-grade peers: through using sequential coding blocks, if/then envelopes, and scene-change coding blocks. One of Landon's stories, *Adventure to the North Pole* (see Figure 7), illustrates all three of these methods. Landon began his story by programming a teacher having a dialogue with her students, who happen to be cats, and he programmed the teacher to inform her students that they would go to the north pole. This story illustrates how Scratch Jr executes coding blocks from sequentially from left to right. The first scene of this story illustrates how Landon created thoughtful and well-sequenced dialogue between the teacher and her students through the use of three different if/then coding blocks. Additionally, in his story, Landon also integrated three different scene-change coding blocks that program the story to progress through a series of environments and events. Notably, Landon effectively integrated multiple if/then coding blocks, which, according to observations, field notes, and the tutors' story

submission forms, were the most difficult coding feature for both children and tutors to use effectively. His ability to use multiple if/then coding blocks and multiple scene-changing blocks were impressive and resulted in his ability to create a fluid and well-sequenced story.

Details. This component of the standard recognizes the importance of using "details to describe actions, thoughts, and feelings." Similar to the details section in the corresponding first-grade standard, actions in the second-grade stories appeared in two primary forms: actions through movement, including both characters and objects, and actions through dialogue, including both written and oral forms of communication. In *Adventure to the North Pole*, a story by Landon (see Figure 7), Landon programmed the characters to move in the scene on the moon, and he included written dialogue actions in the first, second, and fourth scenes. These written dialogue actions illustrate what the characters said, which provide details and context for the overall story.

This story also conveyed details about the characters' thoughts and feelings as well. For example, in the first scene, after being told by the teacher they would go to the north pole, one cat through a dialogue box said "Yayyyyyy!!!" which indicates it's feeling of excitement. Additionally, in this same dialogue box, Landon integrated several smiley-face emojis, which conveyed the character's excitement (a feeling) through visual means. Furthermore, in the third scene, Landon programmed one cat to say "Shhhhh", which can be interpreted as a verbalization of a thought that the characters in the environment should be quiet. Finally, after returning to the classroom, one cat says "Wooooo" through a dialogue box, indicating a feeling of excitement.

Figure 7. *Adventure to the North Pole* by Landon

In addition to the aforementioned types of details related to actions, thoughts, and feelings, children conveyed details about the story, its characters, and environment through the use of visuals. Visual information, such as the images of characters and the story environment, convey details about who the characters are, what they look like, and what types of environments they inhabit. Landon could have chosen different characters or environments, but he chose to use cats who explored both the moon and the north pole, the latter of which containing additional characters (a polar bear and a penguin) that served as extra student-selected details about the story environment.

Temporal words/signifiers. Second-grade students also used visuals to convey temporality, in a similar fashion as their first-grade peers. In Eva's story, *The Bright Glory Morning* (see Figure 8), she programmed the characters to engage in a well-sequenced dialogue in which the characters respond to one another's comments through

the use of if/then coding blocks. Eva did not need to narrate, “and then the pink cat responded to the yellow cat” because the Eva programmed the story to unfold in a certain way temporally across time, which was to have characters speak in a natural and sequential manner. In Landon’s story, *Was That a Dream?!* (see Figure 9), he uses scene-change coding blocks to change from the jungle to the theater, and then to the moon. The fact that certain scenes occur before others signifies temporality, as was the case with the first-grade children as well.

Figure 8. *The Bright Glory Morning* by Eva, Example 2

Figure 9. *Was That a Dream?!* By Landon

Sense of closure. While some children's stories had a sense of closure, many did not, which aligns with the stories of their first-grade peers. In Landon's *Was That a Dream?!* story, the "The End" in written text at the end of the story signifies story closure, even if the story was not very complex. Landon's *Adventure to the North Pole* also exhibits a sense of closure with the students returning to the classroom after they've gone to the north pole. While some stories conveyed a sense of closure, other did not. Kim created a story, *Fish Fun* (see Figure 10), that clearly lacks a sense of closure. In this story, which contains no written or oral language, a few fish simply twist and turn in the first scene and there are no events in the second scene. Comparing this story to Kim's brainstorming sheet for the day reveals the difference between what she created and what was her overall idea and goal for the story. Her brainstorming sheet indicates that fish are going to the "Fish Queen's party" and "they will play and dance". However, this plot is

not apparent to the viewer, who can only guess what the story is about. The absence of written and oral language can make it difficult to interpret such stories.

Figure 10. *Fish Fun* by Kim

All components. While all stories, even the most basic, like *Fish Fun*, contained sequenced events, details, and temporal signifiers, and few stories demonstrated a sense of closure. As providing a sense of closure is an important part of storytelling, this represents a notable opportunity for future Scratch Jr stories. While most stories lacked a sense of closure, it is also important to recognize how children engaged in the other components and processes related to this standard. Children ordered events in their stories through the sequential processing of the computer coding blocks, and they also used if/then commands and scene-changing coding blocks to have their stories unfold in a particular order. Additionally, children used visual, written, and oral events to describe details about the story, setting, and characters as well as the character's actions, thoughts,

and feelings. Finally, children utilized various methods to signify temporality and illustrate that some actions and events occurred before or after others, representing different periods of time. Thus, the children demonstrated their ability to perform standard-based literacy practices, all of which were influenced by their ability to engage in new literacy skills related to created multimodal stories through digital technology via a multimedia coding application on an iPad.

Writing standard - <u>CCSS.ELA-LITERACY.W.1.5</u>

- With guidance and support from adults, focus on a topic, respond to questions and suggestions from peers, and add details to strengthen writing as needed.

As children's first story lacked prewriting activities (in order to give them broad leeway to create whatever type of story they wanted), but subsequent stories included prewriting activities led by the tutors, this standard will be examined by looking at the children's experiences creating stories without prewriting as well as how prewriting impacted the way they demonstrated this standard. Furthermore, in both of these sections, I looked for patterns in the data that illustrated how with the support of their tutor children focused on a topic, responded to questions, and strengthened their writing through adding details.

Stories created without prewriting. In terms of focusing on a topic, many children appeared to create stories spontaneously and piece-by-piece. For example, children tended to begin their story creation process by browsing characters and settings. One of Sara's tutors wrote "She wants to explore as much of the scenes and characters as possible." My observations support this. Many children did not appear to have a plan before creating their stories, rather, they made decisions as they went, typically beginning

by browsing characters and settings in the program. Subsequently, after choosing characters, many children spent several minutes or more adjusting their characters' appearances, such as changing body color and hair color, which is illustrated the customized characters in Jack's story, *Vat's and Nat's Adventure* (see Figure 11 and how the cats in the story have different customized color schemes).

Figure 11. *Vat's and Nat's Adventure* by Jack

As the researcher, I was interested in how engaged they were customizing their characters, but I was also concerned that they were spending too much time adjusting character appearance and not enough time working on creating coherent stories. While the children were certainly focused and engaged, as was apparent through viewing the children's stories that many children lacked focus on creating a story that had a clear plot. Rather, in addition to spending several minutes on customizing the character's colors (as illustrated in Landon's story), they were focused on choosing characters and settings as

well as exploring how to use the computer coding blocks instead of working on creating a coherent story. This lack of focus on creating a coherent story is demonstrated by Sara's story, *Everybody Plays Things* (see Figure 12), which includes four unrelated scenes.

Figure 12. *Everybody Plays Things* by Sara

In regards to how children responded to questions from the tutors, this varied from child to child. Jack's tutor said "He was pretty independent, didn't need many prompting questions," which aligns with my observations that children largely worked independently; they had numerous brief sessions of dialogue with their tutors, but they spent plenty of time exploring the application and using various features with limited teacher assistance and dialogue. While children's actions and desires led the process, all tutors asked general prompting questions during the child's story creation process. For example, the tutors asked questions such as "what is your story about?" and "which characters do you want to use?" However, some children were more vocal about their

ideas and plans than others, with some students giving brief answers to their tutors as they were more interested in working with Scratch Jr than they were explaining themselves and their ideas to their tutors.

Finally, this standard demonstrates that importance of strengthening writing through adding details, and the corresponding second-grade standard illustrates the value of strengthening writing with revising and editing. Thus, this section will focus on how children strengthened through the use of details and revision. Details, as discussed before in the examinations of previous standards can include characters' actions, thoughts, and feelings. As the tutors regularly asked their students for details about their stories, such as "which characters do you want to use?" and "what do you want your characters to do?" These questions evoked responses from the children that helped them both think of answers to these questions, which represented their ideas and goals for them to work towards.

For example, in response to a probing question related to the actions of characters, children often indicated that they wanted to have the character speak, but some of the children did not know how to program their characters to say something. So, after asking probing questions and recognizing a need for support, the tutors showed the children how to use the written-text bubble coding block and the audio-recording coding block to help their children program their characters to say things through both written and oral language, as was the case with with Sara's story, *Everybody Plays Things* (see Figure 12). Sara's tutors showed her how to use the audio recording function, and they also listened to her dictations for written character dialogue, which a tutor then typed into the program. Through tutor questions and support, Sara brought her ideas to life, which

demonstrates how with adult support, Sara was able to add details, including character actions and thoughts, to her story.

In addition to adding details to strengthen their stories, another primary way that children, with the assistance of their tutors, strengthened their writing was through debugging, which is the process of adjusting code to ensure that the program (or story in this case) runs properly and in line with the coder's goals. In my observations, debugging was one of the most frequent types of support that the tutors provided their students, which was often an iterative process of revision. For example, children often expressed a desire to have their characters move a specific distance in a particular direction that would be appropriate for a story (e.g., one character moving towards another before speaking). However, sometimes their characters would go too far or in the wrong direction, in which case the children expressed their goals to the tutor who could then support them in changing the distance or direction of movement. Afterwards, they would run the program again to see if the child now approved of the distance/direction. If so, they could move on; if not, then they would continue debugging until the character's movement was agreeable to the child.

Stories created with prewriting. In contrast to the children's experiences creating stories without prewriting, in which tutors provided little guidance in the story creation process other than asking general probing questions and providing technical support, the children's experiences creating stories with prewriting was marked by greater tutor involvement and support in their students' creative processes. These sessions began with the tutors and children planning their stories by discussing story features such as characters, setting, plot, and events. The tutors and children engaged in valuable

dialogue about what these features are and how they could be integrated into the children's stories.

The tutors were pleased with the prewriting activity, and a few of them commented on how it helped their student create a more focused story. This was evidenced in the stories themselves, which were more coherent than the non-prewriting stories. Creating a plan not only helped the tutors and children focus on the content of the story, but it also allowed the tutors to provide more guidance to the child as they had now established a goal for their story. In some instances, the children would still spend a lot of time customizing their characters' colors, but the tutors encouraged their children to wrap up and move on towards completing the story they discussed in prewriting.

During prewriting, some students were antsy to begin working on the iPad. Sara's tutor noted that Sara was "anxious to touch the iPad and get going when we were pre-writing," which was also the case with other children, but prewriting resulted in valuable question-and-answer discussions between students and tutors related to various features of stories, and provided students an established goal that helped them focus and guided their creative and revision processes, all of which connects to this literacy standard. Ultimately, adding the prewriting activity resulted in additional teacher support and enhanced children's ability to focus on a topic, engage in question-based dialogue with their tutor, and strengthen writing through adding details and engaging in revisions, including through debugging.

Writing standard - <u>CCSS.ELA-LITERACY.W.2.5</u>

- With guidance and support from adults and peers, focus on a topic and strengthen writing as needed by revising and editing.

This standard was addressed by second-grade children in a similar way to how their younger peers addressed the corresponding first-grade standard through focusing on a topic, responding to questions from adults, and adding details to strengthen writing. Similar to the previously described standard, as some of the children's stories involved prewriting while others did not, this section will examine this standard by separating the prewriting story experiences from the non-prewriting experiences. I examined and reflected on the tutors' story submission forms, my field notes, my observations, and the children's stories to determine the results for this research question.

Stories created without prewriting. The second-grade children were generally better able to focus on a topic even without prewriting than their first-grade peers. Their stories were more coherent, even if some of them seemed incomplete or ended abruptly. For example, in Eva's Story, *The Play Date* (see Figure 13), Eva focused creating a story about two cats seeing and greeting each other at the library, and then one asked the other if she wanted to play. While this story doesn't advance further than this, it still represents a focused story that Eva created without prewriting.

While the second-grade children were generally able to maintain focus on a topic, Landon's tutor noted Landon "shows extreme independence and confidence with the app. The only concern, however, is Landon's inability to create a cohesive story." Landon's story, *Was That a Dream?!* (see Figure 9), demonstrates little in the way of story progression. Similar to his first-grade peers, he seemed to browse and select characters and environments without having a clear direction or goal, and he spend a lot of time customizing characters, which showed a lack of focus on creating a cohesive story. Landon is a child who often has difficulty focusing. However, interestingly, he had no

problem focusing on using Scratch Jr and creating his story, rather, he had difficulty creating a cohesive story, as his tutor mentioned in her notes.

Figure 13. *The Play Date* by Eva

In terms of responding to questions from tutors in the non-prewriting sessions, the second-grade children often gave brief answers to the tutors' prompting questions, including questions such as "what is your story about?" and "what do you want your character to do?" In responses to such questions, the children often showed a desire to continue working on their stories, similar to their first-grade peers. While some teachers asked more questions than others, the limited dialogue between students and tutors was influenced by some tutors' reticence of asking too many questions or providing too much guidance, which was cautioned against in the research procedures as to not majorly influence the children's stories. The children's limited dialogue, however, can also be attributed to their high level of engagement, reflecting a let-me-keep-working attitude.

However, while children often gave brief answers to their tutor's prompting questions about the stories, one tutor noted a strategy for how she promoted dialogue. Eva's tutor noted, "She worked mostly independently; she likes to make decisions without telling us what she's doing, so I try and make her think out loud as much as I can." Thus, encouraging think-alouds is one strategy for promoting student-tutor dialogue, which can also help the tutor understand their student's thinking processes and goals.

In terms of strengthening writing through revisions and editing, the second-grade children engaged in debugging, which aligns with revision and editing processes, to improve their stories. Debugging often included altering the distance and direction of characters' movements in order for their story, and the characters' movements within, to make more sense. Additionally, as previously noted, one of the most difficult features for the both the children and the tutors was the use of if/then envelopes to sequence events and dialogue. Landon's tutor noted that she assisted him with the use of these envelopes after he struggled with using them effectively in his story, *Was That a Dream?!* (see Figure 9). Landon's tutor also noted that she helped him with scene-change coding blocks, as he was initially unable to figure out how to program the story to change between the multiple scenes he created. Both of these examples represent instances of tutor-supported revisions that assisted the child in strengthening his story, which aligns with this standard, and these types of tutor-supported revisions were common for the second-grade children.

Stories created with prewriting. The children's stories were generally more cohesive and complete when the story creation process included a prewriting phase, which illustrated a greater degree of focus for the students, representing a notable

connection to this standard. Comparing Landon's second story, *Adventure to the North Pole* (see Figure 7), which involved prewriting, to his first story, *Was That a Dream?!* (see Figure 9), which did not include prewriting, illustrates this point. His second story illustrates a more cohesive story with a plan for the characters (to go to the north pole), which was accomplished and demonstrated in the story. Additionally, his second story included more coherent character dialogue, and this more coherent story and dialogue illustrate an enhanced degree of focus on his story and topic.

As was the case for the first-grade children, there was a greater degree of dialogue between students and tutors for the stories that included prewriting than those that did not, which included the tutors asking more questions to the children. The prewriting sessions were approximately five-minute periods in which the children and tutors discussed the meaning and purpose of story features (e.g., characters, setting, plot, and events). During this time, they planned and discussed how those story features would appear in the children's stories, such as which characters and settings they wanted to use and those features aligned with the overall plot and events. As the children created their stories, the tutors asked questions as well as provided guidance and feedback that helped the children bring the story they discussed in the prewriting phase to life in Scratch Jr., a process that involved debugging and revisions to strengthen their stories.

Ultimately, stories that included prewriting processes generally led to the children enhancing their ability to focus on creating a coherent story and resulted in more robust dialogue between the children and tutors. Additionally, the tutors preferred the including the prewriting process in the activity, likely as it resulted in greater dialogue and gave the tutors the opportunity to provide more guidance and support to reach a mutual goal of

creating a specific story with agreed upon plot, characters, and settings. The tutors wanted to teach the children literacy skills and help them create enjoyable and coherent stories, and adding the prewriting process led to tutors feeling more empowered and accomplished in these goals.

Speaking and listening standard - CCSS.ELA-LITERACY.SL.1.5

- Add drawings or other visual displays to descriptions when appropriate to clarify ideas, thoughts, and feelings.

This speaking and listening standard highlights the value of connecting visual displays with speaking and listening activities, and this section will examine these processes in two ways. First, it will examine how children integrated speaking and oral language into their digital stories, all of which contain visual elements. Second, it will present how children engaged in speaking and listening with their tutors while creating their Scratch Jr stories, all of which contained visual elements.

Oral language in Scratch Jr. In order to analyze the use of oral language in the children's Scratch Jr stories, all of the first-grade children's stories were examined to determine the presence (or absence) of oral language within the stories. Additionally, after locating the use of oral language in the stories, tutor's notes were consulted to discover how oral language recordings were used in the story creation process.

Only one first-grade child, Sara, included oral language in her stories, which she integrated through utilizing the voice-recording coding blocks. Sara used oral language in two of her stories, *Everybody Plays Things* (see Figure 12) and *Tac and the Fairy* (see Figure 2). These stories illustrate two types of oral language: words and oral sound effects. In *Everybody Plays Things*, Sara programs characters, who are represented

visually, to say things, such as “Hi,” “Hello,” and “Wow.” In terms of sound effects, recorded her own voice to make a neighing sound for the horse in this story, and she also recorded her voice in *Tac and the Fairy* to program the fairy to making a yawning sound. While these stories are not very complex or plot-driven, they still represent ways that Sara coupled oral language with visuals in her stories.

Sara’s tutor’s notes provided additional information on the process of integrating oral-language recordings into the stories. Sara was unsure how to use the audio-recording coding block, so her tutors helped her understand how it can be utilized to record one’s voice and integrate into the story through coding. Additionally, while Sara was initially hesitant to use the recording feature, she ended up using it on several occasions. Her tutor noted that “she liked listening to herself on the app,” which was demonstrated by her joyful expressions and laughter after listening to her voice recordings and likely influenced her repeated use. Furthermore, through my observations I noticed that Sara deeply enjoyed working in Scratch Jr, which was supported by her tutor’s comments that “she’s very engaged with the iPad” and “she’s all smiles while working on the app,” and while these sentiments were illustrative of her overall experience, Sara’s use of oral recordings was a notable component of this experience.

Speaking and listening with tutors. While creating their stories, the children engaged in numerous story-centric conversations with their tutors that connected their thoughts, ideas, and feelings to the visual features of Scratch Jr, which connects with this standard. These conversations included questions and answers from teachers to students and vice-versa, and these conversations included think-alouds and reflective dialogue from the children. I prepared the results in this section through examining and reflecting

on the tutors' story submission forms, my field notes, and my observations to see how the children's oral dialogue with the tutors was mediated and influenced by references to the visual displays of Scratch Jr. The results are described below.

As noted in a previous standard, the children engaged in a variety of question-answer dialogues with their tutors. The tutors regularly asked the children about their ideas and plans, and the children responded, although, sometimes their responses were brief, particularly in the stories without prewriting. Given that the primary goal of each session was to create a story with Scratch Jr, which is a program that requires viewing and selecting visual elements to code and create the story, nearly all of the conversations between the children and the tutors included references to the visual displays of Scratch Jr, which aligns with this standard.

A common example of this was the processes of children browsing and selecting characters and settings. For example, as children discussed potential character and setting choices, they would regularly refer to the iPad to demonstrate that they want to choose a particular character and then change the character's color/appearance in a specific way. Additionally, children often indicated their desire to program a character or object to move, but it was only when they interacted with Scratch Jr's visual display that their tutor would understand the child's desired direction and distance of movements. Character selection, appearance, and movement was a common topic of dialogue, often in the form of questions and answers, between the children and tutors, and it nearly always included references to the visual display of Scratch Jr by both the children and tutors.

Tutor's questions and prompting statements also encouraged students to think-aloud to promote dialogue and help the tutor understand the children's thinking and

decision processes, which were often mediated by references to the content (e.g., characters, settings, and coding blocks) of the visual display. Furthermore, the tutors' questions and the children's think-alouds also resulted in children reflecting on their story creation process and progress. Through such dialogue children sometimes demonstrated a need for support, such as children verbally and visually (by pointing to the screen) indicating they wanted to use the if/then coding block, but they did not understand how to utilize it. When the children demonstrated that they needed their tutor's help, then teachers would demonstrate and discuss how to use various features to promote student learning and proficiency with the task.

Ultimately, the children regularly communicated their thoughts, ideas, and feelings with their tutors through speaking and listening while referencing and interacting with the visual features of Scratch Jr, which connects to this standard. Additionally, while only one first-grade child, Sara, used audio recordings in her stories, both through words and oral sound effects, Scratch Jr has the potential to integrate oral language into the stories themselves. For some reason, however, most children did not use this audio recording feature, but it represents an opportunity for future storytelling that integrates oral language with digital stories.

Speaking and listening standard - CCSS.ELA-LITERACY.SL.2.5

- Create audio recordings of stories or poems; add drawings or other visual displays to stories or recounts of experiences when appropriate to clarify ideas, thoughts, and feelings.

This speaking and listening standard focuses on how children use verbal communication in conjunction with visual displays and through audio recordings. Similar

to the how the corresponding first-grade standard was examined above, this section will examine how the children used oral language through audio recordings in their Scratch Jr stories and how they engaged in oral communication with their tutors in ways that described their ideas, thoughts, and feelings while referencing the visual display of Scratch Jr. All of the second-grade children's stories were examined for the presence and use of audio recordings; the findings of which are presented below. As for the children's dialogue with the tutors, the data were drawn from observations, field notes, and the tutor's story submission forms was examined to understand how the children engaged in speaking and listening with tutors while referencing the visual displays of Scratch Jr.

Oral language in Scratch Jr stories. Two of the four second-grade children utilized oral language through audio recordings in their Scratch Jr stories, both of them using it in two of their three total stories. These second-grade children, Eva and Landon, utilized both words and oral sound effects through the audio recordings. In regards to the oral sound effects, in Eva's story, *The Bright Glory Morning* (see Figure 8), Eva recorded herself making a snoring sound. This story also represents how she used words in her story that verbalize the character's thoughts, "I could wake up now," which fits coherently with the rest of the dialogue and the overall story. Another one of Eva's stories, *The Play Date* (see Figure 13) also illustrates how she programmed the story to intertwine oral and written language through a well-sequenced character dialogue that were presented in conjunction with the visual features of Scratch Jr.

Landon's also used audio recordings to include oral language his stories. In his story, *Was That a Dream?!* (see Figure 9), he programmed a character to say "Woah" through an audio recording as another moved across the screen in the first scene. In the

second scene, using written language he programmed the red cat to say “Was that a DREAM,” which was immediately followed by the same cat using an audio recording to orally say “I think so.”

The sequence of this dialogue makes sense, but Landon’s use of oral language also highlights a challenge of using audio recordings in Scratch Jr stories, which is that it can be difficult for an audience to interpret which character is speaking through an oral recording. For example, in the first scene, one audience member might presume that the cat who is moving also says “Woah,” while another person might interpret to be the non-moving cat who says “Woah.” Landon programmed the stationary cat to say “Woah,” but unless the audience examines the code, they cannot be sure of the author’s intentions or how they programmed the story to unfold.

Similarly, in the second scene of this story, the red cat says “Was that a DREAM” through written language and then the same cat is programmed to say “I think so” through an audio recording. However, an audience member who did not look at the code might interpret this to be a dialogue between the two cats, with the red cat initially asking “Was that a DREAM” and the green cat responding verbally “I think so.” While the story can work either way, the audience may need to make inference about whose voice is represented through audio recordings, which may vary from person to person. This is not necessarily a problem, but it highlights an issue with using audio recordings in Scratch Jr and could be considered a limitation of the program. Nonetheless, both children used oral recordings in conjunction with visual displays that illustrated logical patterns of thoughts and dialogue, which connects with this standard.

Speaking and listening with tutors. As was the case with the first-grade children, the second-grade children regularly engaged in verbal communication with their tutors to express their thoughts, ideas, and feelings while referencing and selecting visual elements during their story creation processes. According to the data, which included the tutors' story submission forms, my field notes, and my observations, this verbal communication regularly included questioning and answering as well as think-alouds and reflective comments from the children, which are described below.

Children and tutors regularly engaged in asking questions and providing answers while referencing the visual display of Scratch Jr, though, sometimes the children's responses were brief, which often led to additional questions and prompts from the tutors to promote dialogue. For example, Eva's tutor noted that Eva "likes to make decisions without telling us what she's doing, so I try and make her think out loud as much as I can." When Eva and other students engaged in think-alouds prompted by tutors, they essentially narrated their thoughts while referencing and interacting with the visual elements of Scratch Jr, aligning with this standard.

More specifically, much of the student-tutor dialogue revolved around selecting and customizing characters as well as selecting computer codes to bring the characters to life. For example, children regularly described their plans and actions while referencing the visual elements on the iPad when responding to the tutors' prompts and questions. As some children wanted to sequence events and dialogue between characters and as children had difficulty utilizing the if/then coding block, this was a common topic of student-tutor discussion that often led to student learning. For example, Landon learned how to use envelopes independently after having a few discussions and instances of

scaffolded instruction from his tutors. These conversations included both Landon and his tutors speaking, listening, and referring to the visual elements Scratch Jr that eventually led to his mastery over what was the most difficult feature of Scratch Jr for children and tutors alike.

Ultimately, this standard illustrates the importance of children connecting verbal communication to visual displays and utilizing audio recordings in storytelling. Two of the four second-grade students utilized audio recordings in their stories, which this standard recognizes to be a valuable process for second-grade children, and while the other two did not use the audio recording feature, it remains a possibility and an opportunity for growth. Furthermore, all students regularly utilized their speaking and listening skills when referencing visual elements in ways that demonstrated their thoughts, ideas, and feelings, which illustrates that teachers can use Scratch Jr as a tool to help students develop proficiency in this standard.

Conclusion to research question 1

Overall, the children demonstrated their ability to engage in literacy activities that align with the Common Core educational standards presented in this section. All children sequenced events, provided details, and used temporal signifiers in their stories, which aligns with the first two standards examined in this section. However, few children demonstrated a sense of closure, which is also recognized as important by these standards. Thus, in the future, children, with the help of educators, can focus on conveying a sense of closure in their Scratch Jr stories.

Furthermore, children focused on and responded to questions from their tutors to help them develop and revise their stories, processes that align with the third and fourth

standards examined in this section, and their revision processes largely consisted of debugging, in which the children revised their coding blocks in an effort to make the story unfold in a smooth and natural manner. Additionally, the stories that involved prewriting processes generally led to more cohesive stories from the children, as the prewriting activity helped the children and tutors establish goals to work towards.

Finally, the children engaged in the final two Common Core standards examined in this section, which relate to connecting oral language with visual displays in two primary ways. All of the children discussed their ideas and stories with the tutors while referencing the visual display of the Scratch Jr app on the iPad. Their discussions revolved around their ideas and goals for the story, and these discussions involved both the children and tutors pointing to and describing visuals on the screen that helped them convey their ideas. Additionally, a few of the children utilized audio recordings in their digital stories, which also aligns with these standards of connecting oral language to visual displays. These children recorded their voices and spoke and made sound effects on behalf of their characters, which align with these two standards.

Ultimately, the children in this study demonstrated their ability to engage in standards-based literacy activities. These were valuable processes, and demonstrated how children can engage in literacy practices through computer coding. While there were some instances of the children not demonstrating proficiency in every element or literacy process associated with a particular standard, such as conveying a sense of closure or utilizing oral audio recordings, these children still engaged in valuable literacy practices, and the instances and children who did not demonstrate advanced proficiency in these

areas represent areas for growth that can be addressed through effective educator instruction in the future.

Research Question 2:

What Types of Narratives Elements Do First- and Second-Grade Children Produce Using a Multimedia Coding App?

Overview

Narrative elements are components that fulfill certain roles in stories (Peterson & McCabe, 1983). As described in the methods section, there are two types of narrative elements: content categories and functional categories. Content categories correspond with more basic stories that lack causal events, and functional categories correspond with more advanced stories that include causality of events (Peterson & McCabe, 1983). Examining narrative elements illuminates how children use different types of narrative content and functions to express themselves through storytelling, and thus, allow researchers to develop an understanding of how children tell stories. This section will first examine broader patterns of how the children used story elements in their Scratch Jr creations, and then it will examine each type of story element in greater detail to illustrate how children used the story elements in specific instances.

The coding procedures for identifying and classifying story elements was as follows. First, each story was examined for causality (i.e., did certain events cause other events to happen). When the stories did not contain causal events, I analyzed the story by identifying content story elements based on Peterson & McCabe's (1983) classification system of content story elements, which provides description of the different types of content story elements to aid in the analysis process. Similarly, if the story did contain

causal events, then using Peterson & McCabe's classification system of functional story elements, I analyzed the stories to determine which functional story elements were present in the children's Scratch Jr stories. Thus, in the sections below that illustrate the presence and use of various story elements in the children's stories, each story element is initially identified and described to illustrate what types of information can be classified as that type of story element. These sections also illustrate the frequency of each story element.

Furthermore, as Peterson and McCabe examined children's oral narratives and this study examines multimodal stories, in line with McCabe's suggestion via our personal email communication, in conjunction with identifying the story elements, I determined the mode of communication through which story elements were conveyed. For example, a story element, such as an event, which includes "natural occurrences, actions, and environmental states resulting from actions" (Peterson & McCabe, 1983, p. 69), can occur through different modes of communication. An event could be conveyed visually, such as when a character moves across the screen. An event can be conveyed through written information (e.g., a character's dialogue presented via a written-text bubble). Finally, an event can occur through oral communication, such as when a user programs a character to present verbal dialogue through an audio recording.

After identifying the presence of story elements in each story and the mode through each story element was conveyed, I determined the frequency of each type of story element by calculating the total number of each type of story element across all of the stories. In this process I also calculated the breakdown of these story elements were represented through the different modes of communication (visual, written, and oral).

These calculations produced a quantitative description of the frequency of each type of story element and the mode through which they were conveyed across all of the children's stories. This quantitative information is presented in the tables below, which are supplemented by examples that illustrate how children utilized story elements in their Scratch Jr digital stories.

Comparison of content and functional story elements

Children used functional story elements at four times the rate of content story elements, with 396 total functional story elements (i.e., the story elements present in stories that contained causal events) and 99 total content story elements (i.e., the story elements present in stories that lacked causal events (see Tables 3 and 4).

There were six stories with content elements and 18 stories with functional elements. The prominence of functional story elements illustrates that most children's stories contained causality in which characters frequently reacted towards one another's actions and dialogue. The functional story elements correspond to more complex stories with causal events, which will be presented in more detail after examining the content story elements in the children's stories. These content story elements correspond with simpler stories that lack causality and will be examined next.

Content story elements

Overview. Content story elements correspond with stories that lack causality and generally describe characters and their actions within a particular setting. As noted above and illustrated in Table 3, there were were a total of 99 story elements, which were primarily comprised of actions and external states. Additionally, as illustrated in Table 5, 86/99 of the content story elements were conveyed visually. These visual story elements

were composed primarily of visual actions (e.g., character movement), visual external states (e.g., images of settings and characters), and visual natural occurrences (e.g., scene changes). Table 5 also illustrates how the relative infrequency of children using written and oral content story elements in comparison to visual story elements. These content story elements are presented in more depth below.

Table 3

Overview of Content Story Elements

	Content Story Elements	Actions	External States	Internal States	Natural Occurrences
Total for 1st Graders	59	24	28	0	7
Total for 2nd Graders	40	17	21	0	2
Grand Total	99	41	49	0	9

Note. Actions, External States, Internal States, and Natural Occurrences are types of content story elements

Table 4

Overview of Functional Story Elements

	Functional Story Elements	Events	Motivating States	Attempts	Con.	Reactions	Set.	Judge.	App.
Total for 1st Graders	169	79	6	3	3	23	53	0	2
Total for 2nd Graders	227	117	8	5	4	33	56	0	4
Grand Total	396	196	14	8	7	56	109	0	6

Note. Abbreviations: Con. (Consequences), Set. (Settings), Judge. (Judgements), App. (Appendages)

Table 5

Content Story Elements by Mode

	Content SE	Visual Content SE	Written Content SE	Oral Content SE
Total for 1st Graders	59	47	6	6
Total for 2nd Graders	40	39	1	0
Grand Total	99	86	7	6

Actions. "Actions are the behavior of a character" (Peterson & McCabe, 1983, p. 70). Actions in the stories were primarily character movements, but there were also instances of written and oral language as well, which corresponded with written and oral actions (see Table 6). As the coding tiles at the bottom of Sara's story, *Everybody Plays Things* (see Figure 15), the horse is programmed to move, which is a visual action, and through an audio recording, the horse goes "neigh", which represents an oral action. The coding tiles in another of Sara's stories, *Tac and the Fairy* (see Figure 15) illustrate how she programmed characters to display written text (written actions) to communicate information. Ultimately, the actions in the stories illustrate the characters' movement and dialogue, which included both written and oral communication.

Table 6

Actions by Communicative Mode

	Visual Actions	Written Actions	Oral Actions	Total Actions
Total for 1st Graders	12	6	6	24
Total for 2nd Graders	16	1	0	17
Grand Total	28	7	6	41

Figure 14. *Everybody Plays Things* by Sara, Example 2

Figure 15. *Tac and the Fairy* by Sara, Example 2

External states. External states serve to describe and illustrate the story environment. The external states in the children's stories were all conveyed through the visual mode of communication (see Table 7). There were three types of external states identified in the data: settings, characters, and objects. In Sara's story, *Everybody Plays Things* (see Figure 14), the initial setting is the farm, but subsequent settings include the ocean, outer space, and a gymnasium. In terms of characters, the horse is a character in the highlighted scene of Figure 14, and there are additional characters in subsequent scenes. Finally, the objects in the highlighted scene of Figure 14 are the barn and the cloud, which were specifically included and placed in the story by the child. These objects also convey information to the audience about the story environment. External States that are conveyed orally through writing were not present in the data, which is likely because they are unnecessary as the likely children found it easiest to convey information about the story environment through the use of visuals. A child could, for example, program a character to say "It is cold outside", either through written or oral communication, which would describe the story environment, but such descriptions were not present in the children's stories. In sum, all of the external state story elements were conveyed visually.

Table 7

External States by Communicative Mode

	Visual External States	Written External States	Oral External States	Total External States
Total for 1st Graders	28	0	0	28
Total for 2nd Graders	21	0	0	21
Grand Total	49	0	0	49

Internal states. Internal states include information on the characters, such as "likes and dislikes, personality traits, and habitual feelings" (Peterson & McCabe, 1983, p. 70). There were not any internal states in the children's stories (see Table 8). This was likely influenced by the fact that clearly conveying information about a character's likes and feelings would likely need to be conveyed through written or oral language, and there were relatively few written and oral content story elements in the first place, which did not provide many opportunities to reveal information about characters' personalities. Ultimately, the children decided not to include information that could be interpreted as an internal state in their stories.

Table 8

Internal States by Communicative Mode

	Visual Internal States	Written Internal States	Oral Internal States	Total Internal States
Total for 1st Graders	0	0	0	0
Total for 2nd Graders	0	0	0	0
Grand Total	0	0	0	0

Natural occurrences. "Natural occurrences are changes in the environment" (Peterson & McCabe, 1983, p. 70). The natural occurrences/environmental changes in the children's stories were all represented visually (see Table 9). There were two types of these visual natural occurrences. For example, in Figure 14 (and its accompanying video), there were three scene changes from one environment to another (e.g., farm to ocean, ocean to outer space, outer space to gymnasium), and in Figure 15 (and its accompanying video), the scene changed from the moon to another location in outer space to a bedroom. These scene changes occur automatically through when a child

utilizes the red scene-change coding tile, as shown at the bottom of Figure 14. Additionally, in Figure 15, another natural occurrence takes place in the outer space scene, when the spaceship moves around the screen. Ultimately, the children stories contained natural occurrences/environmental changes, all of which were conveyed visually.

Table 9

Natural Occurrences by Communicative Mode

	Visual Natural Occurrences	Written Natural Occurrences	Oral Natural Occurrences	Total Natural Occurrences
Total for 1st Graders	7	0	0	7
Total for 2nd Graders	2	0	0	2
Grand Total	9	0	0	9

Functional story elements

Overview. Functional story elements correspond with stories that include causal events, which stands in contrast to the content story elements, which were just examined above and correspond with stories that lack causality (Peterson & McCabe, 1983). As Table 4 demonstrates, there were a total of 396 functional story elements, which were primarily composed of events (196), settings (109), and reactions (56), representing 361 of the total 396 functional story elements. Additionally, as Table 10 demonstrates, 204 of these story elements were conveyed through the visual mode, 181 story elements through the written mode, and 11 story elements through the oral mode. This data illustrates the children's preference to communicate meaning through visual and written modes over

oral communication via audio recording. These functional story elements are presented in detail below.

Table 10

Functional Story Elements by Communicative Mode

	Functional SE	Visual Functional SE	Written Functional SE	Oral Functional SE
Total for 1st Graders	169	97	72	0
Total for 2nd Graders	227	107	109	11
Grand Total	396	204	181	11

Note. Abbreviation: SE (Story Elements).

Events. Events are "natural occurrences, actions, and environmental states resulting from actions" (Peterson & McCabe, 1983, p. 69). The children's stories contained a variety of events. As indicated in Table 11, most events were conveyed through either visual or written means, and there were relatively few oral events. Visual events were mostly comprised of character movements, yet scene changes also contributed to this category. Additionally, a few children integrated emojis into the character's dialogue boxes, which visually expressed a character's issues and emotions related to the character's state of mind, which is illustrated in Eva's story, *The Bright Glory Morning* (see Figure 16 and its accompanying video). Written events (written character dialogue) were the most common type of events. Oral events, which were instances when a child recorded his or her voice, were the least common. All three types of events are present in the accompanying video to Figure 16. The yellow cat hops, a character movement and visual event. There is written character dialogue, written events, and finally, there is oral language used through audio recordings, oral events.

Table 11

Events by Communicative Mode

	Visual Events	Written Events	Oral Events	Total Events
Total for 1st Graders	41	38	0	79
Total for 2nd Graders	43	67	7	117
Grand Total	84	105	7	196

Figure 16. *The Bright Glory Morning* by Eva, Example 3

Motivating states. Motivating states are goals that motivate characters. As Table 12 illustrates, most motivating states were conveyed through written language. For example, in Elle's story, *Fun Scratch Jr*, (see Figure 18), the young girl says "Let's get our swimming suits", which conveys her goal of getting their swimsuits through written language. There was only one instance of an oral motivating state, which was when a character in a different story orally said "Let's build", denoting his goal of building something. There were zero instances of visual motivating states, which is likely related

to the difficulty children may have conveying character goals through visual means in Scratch Jr.

Table 12

Motivating States by Communicative Mode

	Visual Motivating States	Written Motivating States	Oral Motivating States	Total Motivating States
Total for 1st Graders	0	6	0	6
Total for 2nd Graders	0	7	1	8
Grand Total	0	13	1	14

Figure 17. *Fun Scratch Jr* by Elle, Screenshot 1

Figure 18. *Fun Scratch Jr* by Elle, Screenshot 2

Figure 19. *Fun Scratch Jr* by Elle, Screenshot 3

Figure 20. *Fun Scratch Jr* by Elle, Screenshot 4

Attempts. Attempts are actions that aim to achieve a goal. As indicated in Table 13, there were a total of eight attempts in the children's stories, which were equally split into four visual attempts and four written attempts. Visual attempts were character movements that aim to achieve a previously identified goal. For example, in Elle's story, *Fun Scratch Jr*, (see Figure 18), after the younger girl says "Let's get our swimming suits" through a written message, the girls begin moving around the bedroom, as if looking for the swimsuits.

Written attempts, on the other hand, were when a character said something in writing that aimed to accomplish a goal. For example, in Eva's story, *The Bright Glory* Morning (see Figure 16), The yellow cat says "Wake up Eva!!" through a written text bubble, representing an attempt to wake up the pink cat.

Table 13

Attempts by Communicative Mode

	Visual Attempts	Written Attempts	Oral Attempts	Total Attempts
Total for 1st Graders	2	1	0	3
Total for 2nd Graders	2	3	0	5
Grand Total	4	4	0	8

Consequences. Consequences are actions that illustrate whether a goal was achieved (Peterson & McCabe, 1983). As Table 14 indicates, there were a total of five consequences, including at least one from each of the three communicative modes. The visual consequence was in Landon's story, *Adventure to the North Pole* (see Figure 21), a story in which a teacher told her class "We will go to the North Pole!", indicating a goal. The setting then shifted, and (after a brief trip to the moon) the students were at the North Pole, which was indicated visually through the new background/setting. There was no language that indicated they were at the North Pole, and thus, this consequence was communicated visually.

Visuals and writing were the most common communicative modes for consequences. Elle's Story, *Fun Scratch Jr* (see Figure 19) represents an example of this. After identifying the goal of finding swimsuits (see Figure 18), the characters move around the room in attempt to find the swimsuits, and then as shown in Figure 19, one of the girls says "I found them!" through a written text bubble, indicating that they have achieved their goal of finding their swimsuits, which represents a written consequence. Finally, the oral consequence occurred in Eva's story, *The Bright Glory Morning* (see Figure 16), in which one character was trying to wake up the other character (a goal).

After the initial dialogue, the sleeping character uses an oral audio recording to inform the other character "I could wake up now", indicating that the goal of waking up the sleeping character has been accomplished.

Table 14

Consequences by Communicative Mode

	Visual Consequences	Written Consequences	Oral Consequences	Total Consequences
Total for 1st Graders	1	2	0	3
Total for 2nd Graders	2	1	1	4
Grand Total	3	3	1	7

Reactions. Reactions are characters' responses to events. Table 15 illustrates that that were 56 total actions in the children's stories, 50 of which were written. The four visual reactions were all emojis that the children included in the character dialogue boxes. Figure 21 illustrates how one character, the green cat, reacted through visual means (i.e., utilizing the smiley-face emojis) to the teacher's declaration that they would go to the North Pole. Written language was the most common mode for reactions, and the North Pole story is also relevant here. As the child's character also used written language when the character said "Yayyyyyyyyyyyy!!!!!!", in response to his teacher's comment about going to the north pole. This is an instance of a written reaction. Written reactions were typically character's responding to one another's dialogue. Similarly, oral reactions were character's responding to one another's dialogue through oral means. In one of Eva's stories, *The Play Date* (see Figure 22), one character asks another "Do you want to play with me?" through written language, to which another character responds, "Sure", an example of a reaction presented through an oral audio recording.

Table 15

Reactions by Communicative Mode

	Visual Reactions	Written Reactions	Oral Reactions	Total Reactions
Total for 1st Graders	0	23	0	23
Total for 2nd Graders	4	27	2	33
Grand Total	4	50	2	56

Figure 21. *Adventure to the North Pole by Landon*, Example 2

Settings. Settings present information about the characters and their environment. Settings were the second most common type of functional story elements, representing 109 of 396 total. All of the settings identified were through visual means (See Table 16), and every single story included settings as story elements. All of the elements that were identified as settings were either scenes/backgrounds, characters, or objects. Examples of

each of these are present in Figure 23, a story entitled, *Birthday party*. There are two scenes in this story: the forest and the library. There are four characters, the four people on the screen. Finally, there are two objects in this story: a table in the first scene and a birthday cake in the second scene.

Figure 22. *The Play Date by Eva*, Example 2

Table 16

Settings by Communicative Mode

	Visual Settings	Written Settings	Oral Settings	Total Settings
Total for 1st Graders	53	0	0	53
Total for 2nd Graders	56	0	0	56
Grand Total	109	0	0	109

Figure 23. *Birthday Party* by Elle

Judgements. "Judgements are statements in which the child steps out of the time frame of the narrative and comments on the narrated events" (Peterson & McCabe, 1983, p. 69). There were zero judgements in the children's stories (see Table 17). This was likely influenced the difficulty of "stepping out of the time frame of the narrative" when the stories exist in a digital world and are viewed by the audience asynchronously. Oral judgements may be possible if the child assumed a narrator's role and said something like "I can't believe the characters did this", but no such statements were made in the children's stories. The absence of judgements was likely influenced both by the types of stories the children were telling and the Scratch Jr application itself.

Table 17

Judgments by Communicative Mode

	Visual Judgements	Written Judgements	Oral Judgements	Total Judgements
Total for 1st Graders	0	0	0	0
Total for 2nd Graders	0	0	0	0
Grand Total	0	0	0	0

Appendages. Appendages include "narrative comments that are attached to either the beginning or the end of the main body of the narrative" (Peterson & McCabe, 1983, p. 33). There was a total of six appendages in the children's stories, all of which were presented through the written mode of communication (see Table 18). There were two types of appendages present in the children's stories. Prologues are statements of "lasting significance of a narrative, occurring at the beginning" (p. 33). Prologues in the children's stories were written messages that were superimposed on the first screen/setting of children's stories. For example, in Figure 21, the words "Adventure to the North Pole" are superimposed on the first screen. This written appendage informs the audience what the story is about. The other type of appendage present in the children's stories were codas, which are "formalized endings of narratives" (p. 33). In two of the children's stories, on the final screen of the story had the words "The End" superimposed on the screen, indicating a formalized ending through written communication.

Table 18

Appendages by Communicative Mode

	Visual Appendages	Written Appendages	Oral Appendages	Total Appendages
Total for 1st Graders	0	2	0	2
Total for 2nd Graders	0	4	0	4
Grand Total	0	6	0	6

Conclusion to research question 2

As demonstrated in this section, children utilized a wide variety of story elements, which they conveyed through different modes of communication: visual, written, and oral. Some types of story elements were much more common than others. For example, nearly all of the content story elements were classified as either the actions of characters or external states, which corresponded with the story setting/environment. Similarly, over three fourths of the functional story elements were classified as either an event or a setting. These results illustrate the children's proficiency for establishing characters, using computer programming to code actions and dialogue for the characters, and choose scenes/settings for the characters to inhabit.

However, the relatively low frequency of motivating states, attempts, and consequences illustrate that many children's Scratch Jr stories have room for development in terms of adding or clarifying characters' goals and goal-directed behavior as well as consequences that serve as conclusions for their stories. Finally, story elements conveyed through visual and written means were far more prominent than story elements conveyed through oral means, which illustrates the children's preferences to convey more information visually and through writing than through oral communication, which

illustrates the children's preferences and opportunities for growth in terms of enhanced integration of oral language in the children's stories.

Research Question 3:

What Types of Structural Patterns of Narratives Do the Participants Create When Using Scratch Jr?

Overview

To be able to determine the types of structural patterns present in the children's stories, two processes needed to occur: (1) determining whether or not the stories had causal events and (2) examining the story elements present in each story. First, as described in the previous section, I examined each story for causal events, as the presence of causality in story determined if the story elements would be classified as content story elements or functional story elements (Peterson & McCabe, 1983). Second, I analyzed each story to determine which story elements were present in the story. After determining which story elements were present in each story, I was able classify the structural pattern of each story by examining which types of story elements were present in that story, as different structural patterns are composed of different combinations of story elements (Peterson & McCabe, 1983).

Using Peterson and McCabe's criteria and descriptions of how certain combinations of story elements correspond with a particular structural pattern, I classified stories that lacked causality as either a descriptive sequence or an action sequence, and I classified stories that contained causality as one of the following: reactive sequence, abbreviated episode, complete episode, complex episode, interactive episode, or incomplete episode. Each of these structural patterns will be examined in detail further

below and presented with examples of how children created these structural patterns in their multimodal stories, but next an overview of the structural patterns of the children's stories is presented.

Children created a variety of structural patterns in their Scratch Jr stories, ranging from descriptive sequences on the basic end to complete episodes, which represent more coherent and complete stories. Of the eight structural patterns of narratives, only six were present in the children's stories (see Table 19). These six patterns largely represent more basic structural patterns in comparison to the five patterns that were not present, which are generally more complicated patterns, but the six structural patterns represent a variety of story types of varying levels of coherence and complexity. Six of the 24 stories lacked causality and were correspondingly identified as descriptive or action sequences, the two most basic types of narrative structures (Peterson & McCabe, 1983), and 18 of the 24 stories included causal events and were identified as reactive sequences, abbreviated episodes, incomplete episodes, or complete episodes. There were no examples of complex episodes or interactive episodes. Examples of how the children's stories represent the various types of structural patterns will be examined next.

Descriptive sequences

This is the most basic type of narrative structure. In descriptive sequences, there are descriptions of the characters, their actions, and the story environment (Peterson & McCabe, 1983). The information within is not causally related, instead, it is simply listed. There was a total of four descriptive sequences in the dataset. Kim's story, *Fish Fun* (see Figure 24), represents one example of a descriptive sequence. In this story, the fish simply twist (or rotate) around in the first scene, and there are no actions in the second

scene. This story did not contain any written or oral language, and thus, the entire story was communicated visually. Another example is a story from Tommy entitled *Bob and Jack* (see Figure 25). In this story, there is no apparent rhyme or reason behind the characters' actions; it is simply a presentation or description of the characters and story environment.

Table 19

Overview of Structural Patterns

	Total for 1st Graders	Total for 2nd Graders	Grand Total
Descriptive Sequences	1	3	4
Action Sequences	2	0	2
Reactive Sequences	5	4	9
Abbreviated Episodes	1	2	3
Complete Episodes	1	2	3
Incomplete Episodes	2	1	3
Complex Episodes	0	0	0
Interactive Episodes	0	0	0
Total	12	12	24

Action sequences

There were two action sequences present in the children's stories. In action sequences, "many actions are logically ordered, but prior actions did not actually cause later actions to occur" and "actions are chronologically rather than causally ordered" (p. 71-72). Figure 15 is a screenshot from an action sequence story. In this story, two aliens pass the ball back and forth, then one says "That was fun" and the other says "That was really fun." This represents a logical order of events in which the aliens pass the ball and then comment on how it was a fun activity. In the second scene, which is unrelated to the first, after flying around, a fairy says "I am going to sleep," and in final scene, the same

fairy flies in the bedroom and through an oral recording makes a yawning sound over the bed. The dialogue, “I am going to sleep” logically precedes the character yawning above bed. This presence of logically ordered, but not causal, actions is the reason why this story was classified as an action sequence.

Figure 24. *Fish Fun* by Kim, Example 2

Reactive sequences

In reactive sequences, “something happens that causes something else to happen,” (Peterson & McCabe, 1983, p. 72). There are elements of causality in these stories. This was the most common type of narrative structure in the children’s stories, representing nine of the 24 total stories. The causal reactions in these stories were commonly dialogue between characters in which one character reacts to another character’s comment. For example, Figures 26-28 illustrate this type of causal reactive dialogue between characters. In Figure 26, the crab calls “Help me!” to which the fish responds “I can’t

help you. I can't go out of water" (see Figure 27). Immediately, the fish responds, and the crab says "Just try!"(see Figure 28). In another example, (see Figure 29), there are five aliens who engage in reactive dialogue. After the alien on the right floats into space, it says "Aaaaaa!" The four aliens on the left then have a dialogue.

1. Black Tac says "Hey look up there!"
2. The purple Tac on the left says "What's that?"
3. Blue Tac says "I don't know!"
4. Grey Tac says "I think it's Tacky!"

Both examples represent causal dialogues in which characters are responding to the comments of another character. The presence of these causal and reactive events were why stories such as these were categorized as reactive sequences.

Figure 25. *Bob and Jack* by Tommy

Figure 26. *Crabby and His Friends* by Tommy, Screenshot 1

Figure 27. *Crabby and His Friends* by Tommy, Screenshot 2

Figure 28. *Crabby and His Friends* by Tommy, Screenshot 3

Figure 29. *Tacky Land and Tacky* by Tommy, Example 2

Abbreviated episodes

There were three abbreviated episodes in all of the children's stories. An abbreviated episode must have goal and a specific consequence accomplishes or fails to accomplish the goal Peterson & McCabe, 1983). Elle's story, *Birthday Party* (see Figure 23) is an example of an abbreviated episode. The goal is represented through the grandfather's written comment "We have to go to a place to buy a cake." The consequence is that they accomplished their goal of getting the cake. This consequence is represented both through the boy's written comment, "We have the cake!" and through the visual image of the cake in the second scene. However, this is not a complete episode as it lacks an attempt to get the cake. It goes from the first scene (with no cake) to the second scene, which had cake, but there was no clear attempt for them to get the cake, and it is unclear where the cake came from. Thus, this was categorized as an abbreviated episode.

Complete episodes

There were three complete episodes in the children's stories. Complete episodes include goal-directed behavior and a consequence. In addition to the consequence, they must have at least two of the three following story elements: events, motivating states, and attempts (Peterson & McCabe, 1983). Elle's Story, *Fun Scratch Jr* (see Figures 17-20) represent a complete episode. In this complete episode, the motivating state or goal is demonstrated through the written te3xt "Let's get our swimming suits" and the attempt is represented by the characters moving around the room immediately after identifying the goal as if looking for their swimsuits. After moving around the room, one character uses written language to say "I found them!", indicating a consequence, which was that the

goal of finding the swimsuits has been accomplished. Complete episodes represented the most cohesive stories and had a clear consequence that was connected to a character's goal-directed behavior.

Incomplete episodes

There were a total of three incomplete episodes in the dataset. Incomplete episodes are similar to complete episodes, but they lack the consequence story element. One of Jack's stories, *Vat's and Nat's Adventure*, (see Figure 30) represents an incomplete episode. In this story, the two cats dialogue back and forth during the first two scenes about the dragon next to them. In the final scene, the red-faced cat says "Let's go!" indicating a goal. Immediately saying "Let's go!", the same cat moves towards the edge of the screen, as if attempting to leave. However, there is no clear consequence. Thus, this is an incomplete episode. If there was a clear consequence (e.g., if the cat reappeared in the next scene in a different environment), it would have represented a consequence (i.e., the cat's goal of leaving was accomplished).

Complex episodes

There were no complex episodes present in the children's stories. Complex episodes are more complicated versions of a complete episode (Peterson & McCabe, 1983). Given that there were many basic stories and only three complete episodes, the lack of complex episodes is not surprising. This was likely influenced by the children's preferences and skills, as well as time constraints and the design of the Scratch Jr application. While some children may have the ability to create more complex versions of complete episodes in Scratch Jr, it was unnecessary, as they were not instructed nor

guided to do so, and they seemed to prefer keeping their stories simple and just having fun with the application.

Figure 30. *Vat's and Nat's Adventure*, Example 2

Furthermore, time constraints influenced the children's stories. A few of the children wanted to continue working on their stories, but they ran out of time, which was indicated by some final settings in stories in which there was no character actions, such as two of Tommy's stories, *Crabby and His Friends* (Figure 27) and *Tacky Land and Tacky* (Figure 28). Debugging their stories, the process of children getting their stories to play and function as desired, was a common process for the children working with Scratch Jr, and this debugging takes time. Finally, Scratch Jr only allows a maximum of four scenes and six if/then envelopes, which limits the level of story complexity. While it is unclear exactly why children did not create complex episodes, these are likely contributing factors.

Interactive episodes

None of the children's stories were identified as interactive episodes. However, this was influenced by the approach to coding these digital stories from an audience's perspective, rather than how the work of Peterson and McCabe (1983) examined the stories from the perspective of the child, as described in the methods section. Interactive episodes describe "one set of events from two perspectives" (p. 71). This stands in contrast to the other types of structural patterns in which there is one primary perspective (i.e., the child's), and these types of structural patterns are, thus, analyzed from the perspective of the child. However, the children's Scratch Jr stories, as indicated in the methods section, were analyzed from the perspective of the audience, and thus, analyzing from the perspective of the audience precluded there from being multiple character's perspectives to be analyzed, resulting in zero interactive episodes.

Conclusion to research question 3

The children utilized a variety of structural patterns in their Scratch Jr stories. These stories varied from simple descriptions of characters' actions and environments to more cohesive stories with goal-directed behavior and consequences. All of these stories were interesting and demonstrated the ideas, goals, and preferences of the children, but the fact that many stories lacked goal-directed behavior and consequences illustrates that there are opportunities for story development in terms of the children creating more complete and cohesive stories.

Conclusion to Results Chapter

In conclusion, as demonstrated in this chapter, the children engaged in a variety of literacy practices when working with Scratch Jr. Through creating stories with Scratch Jr,

the children created a diverse collection of stories with varying story elements and structural patterns. In the next chapter, the literacy practices, story elements, and narrative structures derived through the children's interactions with Scratch Jr will be examined in the context of existing research literature, and I will connect these findings to the literature base and highlight contributions of this study. Additionally, the following chapter will provide implications of this study and directions for future research.

CHAPTER 5

DISCUSSION

Overview

This study illustrated how first- and second-grade children created digital multimodal stories using the Scratch Jr iPad application. Through creating their digital stories, the children engaged in valuable standards-based literacy practices and utilized a variety of story elements and structural patterns, demonstrating their ability to create an array of stories through using visual elements, written text, and oral language. In this chapter, I connect the results of this study to the fields of new literacies and digital storytelling. I also describe this study's limitations, discuss implications for teaching, and provide directions for future research.

New literacies

This study utilized the concept of new literacies (Coiro, Knobel, Lankshear, & Leu, 2008; Lankshear & Knobel, 2011) as a theoretical framework and conceptualized the children's story creation process as a new literacies practice in which children produced digital multimodal stories through combining visual elements, written text, and oral language. This process aligns with the ideas of Lankshear and Knobel (2011) who recognize that digital multimodal texts represent a significant departure "from 'conventional' print-based literacies" and signify a shift towards "producing, distributing, exchanging, and receiving texts through electronic means" (p. 29).

The results from this study illustrate that young children can develop valuable new literacies skills that are critical to communicating in the modern world (Coiro,

Knobel, Lankshear, & Leu, 2008). The children demonstrated their abilities to use digital technologies to tell stories through combining visual, written, and oral modes of communication, which represents the valuable and complex processes of multimodal composing (Kalantzis, Cope, & Cloonan, 2010; Lankshear & Knobel, 2011).

Multimodality was a central feature of the children's stories, as children used visual elements, written text, and oral language in numerous ways in their Scratch Jr stories. The children's stories and the ways they utilized different story elements through various modes of communication is relevant to the concept of modal affordances (Jewitt, 2013; Kress, 2010). Jewitt (2013) describes a modal affordance as the types of information that can be easily conveyed through a particular mode of communication; it is also important to recognize the limitations or constraints of various modes.

The story grammar analysis, which was conducted with a multimodal framing, illustrated that some story elements were typically conveyed through a particular mode of communication. For example, settings and environmental states, which relate to the story environment and characters within, were conveyed through visual means, such as how the children provided details about the story environment and characters' appearances by using visual features in the application. This suggests that the easiest way for children to provide information about the story environment was through visual means. This stands in contrast to motivating states (i.e., the goals of the character), which were conveyed through written or oral modes of communication, illustrating without written or oral language it is difficult to clearly communicate information about a character's goals while creating stories in Scratch Jr. While some story elements were best-suited to be conveyed by a particular communicative mode, other story elements, such as actions and

events, were conveyed through by all three of these communicative modes of focus: visual elements, written text, and oral language. These examples align with the concept of modal affordances (Jewitt, 2013) in that the children used specific modes of communication to convey different types of story elements while creating stories with Scratch Jr on iPads.

The children's ability to create stories using different modes of communication supports existing research that demonstrates how iPads can support the development of new literacies practices and can be used in literacy education (Beschorner & Hutchison, 2013; Hutchison, Beschorner, & Schmidt-Crawford, 2012). The children in this study used iPads to create stories and engage in numerous standards-based literacy practices. While creating their stories, all children sequenced events, which included characters' actions and dialogue, through arranging the Scratch Jr coding blocks, including their use of if/then and scene-changing coding blocks. Children also presented details about the story, characters, and setting through the use of multimodal symbols, and they also used temporal signifiers, which were presented visually, to indicate that time had passed in the story and that some events occurred before others. These findings support the work of Foley (2013), who found that first- and second-grade children who engage in digital composition demonstrate their ability to engage in these literacy standards-based practices.

However, not all children provided a sense of closure to their stories, which was likely influenced both by their goals for their Scratch Jr stories and time constraints. The fact that many stories lacked a sense of closure represents an opportunity for future

educational use, in which educators promote conversation about story conclusions and help their students create stories that demonstrate a sense of closure.

While there is room for improvement in terms of providing a sense of closure, the children demonstrated their ability to engage in activities related to the other two literacy standards examined in this study. The children connected oral language with visual displays through regularly discussing their stories with their tutors and referencing the visual interface of Scratch Jr, and the children demonstrated their ability to focus on a topic and respond to questions in their digital writing processes. Through this processes, the children strengthened and revised their stories, which is an important feature of the writing process and is also relevant for writing from a multimodal and new literacies perspective (Leu, Slomp, Zawilinski, & Corrigan, 2016).

The children largely improved and revised their stories through debugging, in which they adjusted the Scratch Jr coding blocks in order to make their stories run smoothly, as initial coding segments might result in non-functional code or characters behaving in an undesirable way. More broadly, the first- and second-grade children's use of computer coding skills to create multimodal stories was an integral and unique feature of this study. This extends the conceptual work of Hutchison, Nadolny, and Estapa (2015) who describe coding literacy as the ability to use computer programming skills and knowledge to create a sequence of instructions that when executed by an application accomplish a task. These authors argue that coding literacy is "an important type of digital and disciplinary literacy that is relevant to classroom instruction," and they advocate for the use of coding applications, such as Scratch Jr, in literacy instruction as children can engage in valuable literacy activities while also developing their coding

literacy skills (p. 494). This is relevant to the work of Shanahan and Shanahan (2014) who recognize the value of incorporating disciplinary literacy into elementary classrooms.

This study provides empirical evidence that young children can engage in valuable literacy practices by creating multimodal stories through computer coding and supports the work of Hutchison, Nadolny, & Estapa (2015). The children in this study selected and organized computer coding blocks in specific ways that resulted in their creation of digital stories. This is evidence of the children developing coding literacy skills, which relate to utilizing computer coding knowledge and skills to execute a task. The first- and second-grade children demonstrated their ability to use coding knowledge and skills to create a digital story. This suggests that Scratch Jr is an effective way of teaching coding to young children. This is particularly important given that many computer coding languages are difficult to learn and use due to the complexity of the language's syntax (Resnick et al., 2009).

There is limited research that investigates children's ability to engage in storytelling through computer coding, and the existing literature focuses on middle-school students (Burke & Kafai, 2010; Kelleher, 2006). At the time of this study, there was no empirical research that has investigated how young children create digital stories through computer coding. While the work of Resnick, Ocko, and Papert (1988) investigated how children programmed robots and wrote stories on paper about their experience, this is significantly different than the present study in which the children actually created and programmed digital stories, which is more closely related to the work of Burke and Kafai (2010) and Kelleher (2006). This research thus addresses a gap

in the literature and illustrates how even young children can engage in digital storytelling through computer coding. In sum, the children engaged in a variety of current standards-based literacy practices, while also developing their coding literacy skills, both of which occurred through their creation of digital stories.

Digital storytelling

One important issue related to digital storytelling in the context of this research is that while this study examined how children created digital stories through computer coding, the stories they created were influenced by the research procedures and interactions with their tutors. If the activities were structured differently, such as the tutors or I set different expectations for the children or the children had more time to create their stories, then the children's story creation processes would have been different. Thus, the children's processes for digital story development were mediated by the research design itself and their interactions with their tutors. While this study could have been structured differently in terms of student expectations and tutor support, it still illustrates the value of children engaging in literacy practices through creating digital stories with a coding application.

These findings complement the work of Burke and Kafai (2010), who studied how middle-school students created digital stories through using Scratch (a more advanced version of Scratch Jr). The present study, however, focuses on how younger children and also places greater emphasis on literacy skill development in contrast to Burke and Kafai, who were more interested in the computer science aspect, which was also the case of Kelleher (2006), who investigated how middle-school girls engaged in computer coding by creating stories with the Storytelling Alice software. Thus, this

research with its greater focus on literacy development of younger children both complements and addresses a gap in the existing research literature.

In regards to digital storytelling more broadly, as it is not typically associated with computer coding nor fictional stories, this research also contributes to the literature. Garrety (2008) described five primary genres of digital stories, all of which were primarily associated with non-fiction and personal stories, which aligns with Lambert's (2013) foundational work on digital storytelling These stories are certainly valuable, but fiction is an important component of young children's literacy experiences and development. Thus, it is important to recognize that fictional stories can be the focus of children's digital storytelling practices. As is indicated by the work of Garrety (2008), students engaged with digital storytelling typically focus on non-fiction and personal stories. However, the children in this study created stories about aliens in space, cats traveling to the north pole, and a girl turning into a fairy. This was an enjoyable process for children and allowed them to create fun fictional stories similar to many of the books and stories they know and like so well. Thus, we should encourage children to create fictional digital stories, as the process can result in children enjoyably and creatively engaging in literacy practices, which is supported by the findings of this study.

Foley (2013) noted that most of the existing research on digital storytelling focuses on older students. This is supported by the work of Garrety (2008), who demonstrated that much of the literature base focuses on adolescents and preservice teachers. Thus, this study addressed a gap in the literature by investigating the literacy practices of young children engaged in digital storytelling, of which there is limited research. This research illustrates how young children can create digital stories and

engage in standards-based literacy practices in their story creation processes, which supports the work of Foley (2013), who examined young children's personal narrative style of digital stories.

Finally, as noted by the work of Garrety (2008), much of the research on digital storytelling involves a prewriting process, often with the use of storyboarding. This current study examined the children's stories with their initial stories foregoing prewriting and their final two stories included prewriting. As illustrated in the results section, the stories that utilized prewriting tended to be stronger than those that did not, which is an interesting finding and indicates the value of prewriting in digital storytelling, which may a valuable point of analysis in future research studies.

Motivation and engagement

A notable finding of this research was the high-level of motivation and engagement of the students while they created their digital stories with Scratch Jr. Hattie (2009) notes that motivation and engagement positively impact learning, and the high levels of student motivation and engagement are encouraging. Tutors commented on the children's motivation and engagement:

- "[My student] is definitely motivated and engaged with this storytelling process. He has caught on to how to use the program quickly and loves adding conversations and details."
- "[My student] was very engaged and motivated."
- "[My student] remained motivated the entire time."

Quotes such as these were supported by my observations and field notes. It is often difficult for children to focus on educational activities, yet the children in this study

maintained focus for thirty-minute intervals while creating their digital stories. Furthermore, the children's high levels of motivation and engagement in this study were accompanied by a high level of enjoyment with literacy activities. Many educators want their students to enjoy the learning process, and though this can be difficult to accomplish, the children in this study demonstrated motivation, engagement, and enjoyment, which was appreciated by their tutors.

Limitations

While this study contributes to the existing research literature, particularly in the areas of new literacies and digital storytelling, it is not without its limitations. One limitation is that scholars should be cautioned from generalizing the findings of this study to other environments, which is influenced by the sample size of the study. This study illustrates ways that young children can engage in new literacies practices through digital storytelling via computer coding, the experiences of other children may not align with the experiences of the participants in this study.

A similar limitation is that while scholars have shown that cultural and linguistic backgrounds can influence how children tell stories (Champion, McCabe, & Colinet, 2003; Labov, 1972; Schachter & Craig, 2013), this study did not focus on the children's cultural or linguistic backgrounds, which may or may not affected how they created stories. Future research that examines children's cultural and linguistic backgrounds and how those may influence the digital stories that children create would be a valuable addition to the literature.

Another limitation of this study occurred in a reading clinic setting and not a classroom environment. The differences in settings and support from educators (e.g.,

comparing tutors working with a single student to a teacher working with 25 students) would impact the children's overall experiences and the educator's strategies for instruction and learning. Similarly, the children created each one of their stories within a 30-minute time period, which impacted their ability to plan, create, and revise their stories. If children had longer periods of time to plan, create, and revise their stories, their stories would have likely turned out different.

Additionally, as this study occurred in a reading clinic context, children had individualized instruction from their tutors, which while beneficial is also a limitation in that different tutors had different experiences both with literacy teaching and savviness with the Scratch Jr program. The differences in tutors' experiences and skills affected the children's experiences and interactions with Scratch Jr and ultimately the stories they produced. In the future, studies more closely controlling for this instructional variability would be valuable.

Another limitation in the children's process of creating stories was the Scratch Jr application itself. Scratch Jr provides users dozens of characters and settings, but still these are inherent limitations of the application itself. The children naturally choose one or more of the pre-existing characters and settings, and through this process, they do not (or cannot) choose characters and settings that are absent from the application's existing selection. So, while children choose settings like a classroom or the moon, there is no setting for other places, like Jupiter or a cave, which precludes children from creating stories about these settings. Furthermore, Scratch Jr only allows the user to integrate four settings, which precludes children from creating longer and possibly more complex stories. Overall, the children have to work within the limitations of Scratch Jr, and while

it affords a wide range of features and opportunities to the children, it is inherently limited and affects their story creation process and the end product. This represents an opportunity for groups who are developing software like Scratch Jr to create applications that are not as limited in terms of settings or characters by allowing users to easily create, share, and integrate new assets into the program. As professionals in many disciplines seek inspiration and borrow ideas and content from one another, computer scientists included, creating a coding application that allowed young children to do this represents an opportunity for children to engage in these such community-based practices.

Finally, this study largely focused on the children's stories, and while the data included field notes, observations, and the tutors' story submission forms, it did not include interviews with the children, which could have revealed more information about their thoughts and creative processes while working with Scratch Jr. This is a limitation of the study, and including interviews may have provided additional insights as to the children's decision-making and learning processes as well as their overall experience more generally.

Suggestions for instruction

This study revealed how young children can engage in new literacies and digital storytelling practices through computer coding, all while demonstrating their ability to engage in standards-based literacy practices and being excited about the activity. This was a valuable process, but before implementing in educational environments, there are a few important suggestions for instruction to consider.

First, as Hutchison and Woodward (2014) note, it is important to establish educational goals before deciding to integrate instructional technology. In relation to this

research, educators should first determine which educational goals and standards they aim to achieve. Having young children create digital stories with Scratch Jr may or may not help the educators achieve these goals, which would influence whether or not Scratch Jr or digital storytelling should be included in the activities. If a teacher's goal is to develop the students' abilities as relates to one of the standards addressed in this research, then digital storytelling via Scratch Jr may be an appropriate choice, but there are plenty of goals and standards that are not best achieved through Scratch Jr, which should influence the teacher's decision-making process. This idea is supported by Hutchison (2016), who notes in regards to literacy education, "instruction and activities involving coding must be carefully planned" (p. 17).

Second, this study found that the children's stories and the child-tutor dialogue improved when the tutor led a prewriting session, which then served as a guide for the student creating a story. Thus, when using Scratch Jr to create digital stories, educators should strongly consider having the children engage in a prewriting activity to aid in story development. The use of a prewriting graphic organizer was useful for both children and tutors in this study, and selecting a graphic organizer that aids in goal attainment and learning can be helpful.

Third, deciding what type of prewriting discussion and brainstorming can affect the child's end product. One tutor decided to have her student, Elle, think not only about story features such as characters, setting, plot, and events, but she also required Elle to think about a problem and solution for the story. This was the only tutor to lead a problem-solution prewriting discussion, and it led to great results for her student. Elle created two of the most cohesive stories and she demonstrated a sense of closure, which

was lacking in many of her peers' stories and set Elle's stories apart. Educators should consider what type of story they want their students to create, such as a story that integrates a problem-solution or a cause-and-effect structure, and then use this as a central component of prewriting that will guide the student in his or her story creation processes to promote cohesive stories that demonstrate a sense of closure, a writing device that was missing in many children's stories.

Fourth, when educators create an activity in which their students create digital stories using Scratch Jr, the teachers should create an activity structure and timeline that give themselves and their students ample time to create cohesive stories. This research found that the thirty-minute time limit constricted students from completing the stories they had envisioned. Structuring this activity differently, perhaps by including multiple work sessions that allow students prewrite, draft, revise, and publish would likely result in students being more careful and reflective in their writing process, which can enhance learning (Harris, Graham, Brindle, & Sandmel, 2009).

Fifth, educators should have their students publish and share their stories after they have engaged in the writing process. In this study, the prewriting graphic organizers demonstrated that some of the children had additional ideas that they did not or could not integrate into the story, which was likely influenced both by time constraints and the limited number of characters, objects, and settings. Thus, after the children have created their stories, children should be able to present their story in front of their peers, which would be supplemented by a verbal description of the children's thoughts on the story as well as to provide background information that might not be clearly conveyed in the story. This would also provide an opportunity for each child's peers to ask questions and

provide feedback, which relates to oral language development and is valued by the Common Core State Standards (National Governors Association Center for Best Practices & Council of Chief State School Officers, 2010). This process could take place after the child has created an initial draft, which could then influence the revision process, and/or it could occur by the child presenting his or her final product.

Sixth, as noted in the previous four points, teachers have the ability to shape this activity so it aligns with their educational goals, which can include integrating prewriting, allowing plenty of time for story creation, and having students publish or share their work. Similarly, teachers can shape their Scratch Jr lessons to focus on different aspects of learning, which may be connected to literacy and/or other disciplines. For example, some teachers may want to focus on different patterns of stories, such as problem-solution or cause-and-effect patterns, and they could plan their lesson accordingly.

In terms of other disciplines, teachers may instead want to focus more on the computer science knowledge and skills that children can develop through Scratch Jr to promote coding literacy (Hutchison, Nadolny, & Estapa, 2015), and in this case, they may focus the lesson on how basic concepts of coding and how children can strive to create effective and efficient coding sequences, which could connect with the 2016 International Society for Technology in Education (ISTE) Standards for Students that highlight the value of computational thinking and engaging in iterative design processes to create innovative artifacts (International Society for Technology in Education, 2016). This process also aligns with the Next Generation Science Standards (NGSS) K-2 Engineering Design standards that recognizes the value of comparing different designs and comparing and contrasting different designs to determine strengths and weaknesses

(NGSS Lead States, 2013). Other teachers may want to focus on the math elements associated with Scratch Jr, and they may focus concepts such as addition or multiplication that can be associated with programming the characters to move certain distances in various patterns, activities that teachers could align with the Common Core Math Standards While this study focused on literacy, educators can consider opportunities to integrate Scratch Jr across the curriculum and develop interdisciplinary activities.

Finally, as coding is a fundamental component of creating stories with Scratch Jr, teachers should clearly demonstrate effective and efficient ways of using coding blocks. For example, while the demonstration videos showed that children could change the distance of coding blocks, some children used five move-right coding blocks with a value of one instead of using one move-right coding block with a value of five. Using five coding blocks when one will suffice is inefficient and can be more time consuming to change in debugging and revision processes. Additionally, the if/then coding blocks were the most difficult for the children to use, and while their use was modeled in the demo video, only a few children demonstrated that they could use these effectively. If/then coding blocks are efficient means of sequencing events and dialogue, but some children rarely (or never) used them, which was likely influenced by how difficult they were to use. Teachers should scaffold instruction on difficult features, such as the if/then coding blocks, and offer multiple opportunities for the children to develop proficiency with these blocks. This will allow children to create better-sequenced and more cohesive stories.

In sum, through identifying the children's story creation processes and the story elements and structural patterns of those stories, this study can help teachers plan their

instruction. The implications and suggestions described above are specific enough to aid in instructional planning and implementation, but they should also be recognized as flexible, as all teachers have their own unique classroom environment and student population. Considering these suggestions is important, but it is also important for teachers to decide what is best for their classroom given their specific learning goals and unique classroom context.

Directions for future research

This study demonstrated that when first- and second-grade students create digital stories through computer coding, they can engage in practices that align with current educational literacy standards. While this study contributed to the research literature, further research is needed to better understand how creating stories via computer coding can contribute to student learning. Given the limited research on digital storytelling in the primary grades (Foley, 2013), there are numerous opportunities for future research. First, as existing literature focuses on digital storytelling from a non-fiction or personal narrative perspective, further research should explore the potential of students creating fictional stories through digital means, which would complement the present study and address a noticeable gap in the literature. For example, future research could directly compare the creation processes related to creating fictional vs. non-fictional stories, which would likely illuminate how the processes differ, but can both contribute to student learning in unique ways.

Second, there is limited research related to how children can learn through creating stories through computer coding, and the existing literature focuses on secondary-level students (Kelleher, 2006; Burke & Kafai, 2010). While the present study

begins to address this gap, much more research is needed, particularly in an era marked by increased focus promoting children's computer science and coding skills (International Society for Technology in Education, 2011; Hutchison, Nadolny, & Estapa, 2015; Patterson, 2016). Thus, further research should explore how children can create stories through computer coding. This research should include diverse students from different educational contexts to understand both how these practices can facilitate literacy skills as well as develop coding literacy and computer science skills.

Third, existing research on story grammar analysis (Champion, McCabe, & Colinet, 2003; Peterson & McCabe, 1983; Schachter & Craig, 2013) focuses on children's oral narratives. However, this study used story grammar analysis with a multimodal lens and investigated how children utilized story elements using multiple modes of communication. Further research could extend this approach to analysis and investigate how children utilize various story elements in their digital stories through different multimodal symbols on various digital storytelling platforms and applications. This research could be supplemented by the concept of modal affordances (Jewitt, 2013) to examine which communicative modes are effective at conveying certain types of information and which modes are ineffective, and identifying modal affordances could inform the field of digital storytelling both in theory and practice.

Fourth, scholars who examine children's stories have found that cultural influences exist and can affect how children tell stories, an important issue that was not a focus of this study. However, existing in this area research has focused primarily on oral narratives and stories (Champion, McCabe, & Colinet, 2003; Labov, 1972; Peterson & McCabe, 1983; Schachter & Craig, 2013), but a similar phenomenon may exist for

children's digital and multimodal stories. Additionally, the work of Garrety (2008) recognizes the potential for creating cultural stories through digital means. Future research that examines cultural and linguistic influences on young children's digital stories would be valuable, and may reveal how children from diverse backgrounds may vary in their digital storytelling processes.

Conclusion and personal reflection

This study illustrates that young children engage in valuable standards-based literacy practices while creating digital stories through computer coding, and in doing so, they utilized a variety of story elements and structural patterns. The children's use of multimodal symbols illustrated their ability to utilize the modal affordances of the various communicative modes that helped them tell their stories, and the children were highly motivated and engaged to create stories with Scratch Jr.

These are valuable findings, but future research is needed to develop a more nuanced understanding of how such activities can best promote learning for diverse students in a variety of educational contexts. This research recognizes the value of creating digital stories through computer coding, a position supported by the International Reading Association (2009) who stated that "to become fully literate in today's world, students must become proficient in the new literacies of 21st-century technologies" and teachers need to "effectively integrate these new technologies into the curriculum [to prepare] students for the literacy future they deserve" (p. 1). While many teachers are already working towards this goal, it is the responsibility of educational researchers to investigate different new literacies practices, determine their efficacy, and disseminate their research and its implications for instruction to pre- and in-service teachers

throughout the world. This research contributes to that goal, but much work remains. Education scholars will continue working to investigate effective new literacies practices, and so will I. My work has just begun.

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APPENDIX A

PARENTAL INFORMED CONSENT DOCUMENT

Title of Study: Examining K-2 Children's Digital Stories Created with the iPad Application Scratch Jr

Investigators: Sam von Gillern

This is a research study that your child is invited to take part in. Please take your time in deciding if you will grant permission for him or her to participate. Please feel free to contact me with any questions you may have. I'm available to meet in person, speak over the phone, or communicate through email.

Introduction

The purpose of this study is to learn how children tell stories using Scratch Jr, an iPad application designed for 5-7 year-old children. The stories they create with the help of their reader tutor will be analyzed to determine what types of story elements and structures they use when telling digital stories. The types of communication they use (e.g., visual, oral, and written) will also be analyzed to determine how children use different types of symbols to communicate meaning to the audience. The goal of this study is that through identifying the patterns of their stories may help educators better understand children's preferences for digital communication and opportunities for student growth, which may ultimately influence teacher practice.

Your child is being invited to participate in this study because he or she is currently in kindergarten, first, or second grade.

Description of Procedures

If you allow your child to participate, your child will be asked to listen and participate in Scratch Jr introductory activity at the Reading Clinic, which will take approximately 30 minutes. Then, during the three subsequent tutoring sessions at the Reading Clinic, the child will be asked to develop three stories with Scratch Jr (one story each day, each story being created in approximately 10- to 30-minute period).

Risks or Discomforts

While participating in this study your child may experience the following risks or discomforts: As is the case with any type of teaching or learning activity, sometimes children do not enjoy participating. If your child requests to stop the activity, then their tutor will move on to a different tutoring activity.

Benefits

If you allow your child to participate in this study, there may be no direct benefit to you or your child. It is hoped that the information gained in this study will benefit society by helping researchers and educators better understand how children tell stories and communicate through digital technologies, which may ultimately influence teacher practice.

Costs and Compensation

You and your child will not have any costs from participating in this study. Your child will not be compensated for participating in this study.

Participant Rights

Your child's participation in this study is completely voluntary. You can choose not to give consent or you can withdraw consent at any time without any penalties or negative consequences. Your child may also choose not to participate or withdraw from the study at any time without any penalties or negative consequences.

Confidentiality

Records identifying your child will be kept confidential to the extent permitted by applicable laws and regulations and will not be made publicly available. However, federal government regulatory agencies auditing departments of Iowa State University, and the Institutional Review Board (a committee that reviews and approves human subject research studies) may inspect and/or copy study records for quality assurance and data analysis. These records may contain private information.

To ensure your child's confidentiality to the extent permitted by law, the following measures will be taken: After the data (i.e., the children's digital stories) are collected, the data will be anonymized through removing the children's names from the data. The data will be stored on the researcher's password protected computer. As the data will be anonymized, the children's names will not be reported during any dissemination of this research.

Questions

You and your child are encouraged to ask questions at any time during this study. For further information ***about the study,*** contact Sam von Gillern.

Consent and Authorization Provisions

Your signature indicates that you voluntarily agree to allow your child to participate in this study, that the study has been explained to you, that you have been given the time to read the document, and that your questions have been satisfactorily answered. You will receive a copy of the written informed consent prior to your child's participation in the study.

Child's Name (printed) _____

_____

Printed Name of Parent/Guardian or Legally Authorized Representative

_____

Signature of Parent/Guardian or Legally Authorized Representative

_____

Date

APPENDIX B

IRB APPROVAL FORM

IOWA STATE UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Institutional Review Board
Office for Responsible Research
Vice President for Research
2420 Lincoln Way, Suite 202
Ames, Iowa 50014
515 294-4566

Date: 8/29/2016

To: Sam von Gillern
111 Lynn Ave #603
Ames, IA 50014

CC: Dr. Larysa Nadolny
N164 Lagomarcino Hall
Dr. Donald Bear
N156 Lagomarcino Hall

From: Office for Responsible Research

Title: The Narrative Structures of Children's Digital Multimodal Stories

IRB ID: 16-390

Study Review Date: 8/29/2016

The project referenced above has been declared exempt from the requirements of the human subject protections regulations as described in 45 CFR 46.101(b) because it meets the following federal requirements for exemption:

- (1) Research conducted in established or commonly accepted education settings involving normal education practices, such as:
  - Research on regular and special education instructional strategies; or
  - Research on the effectiveness of, or the comparison among, instructional techniques, curricula, or classroom management methods.

The determination of exemption means that:

- **You do not need to submit an application for annual continuing review.**
- **You must carry out the research as described in the IRB application.** Review by IRB staff is required prior to implementing modifications that may change the exempt status of the research. In general, review is required for any modifications to the research procedures (e.g., method of data collection, nature or scope of information to be collected, changes in confidentiality measures, etc.), modifications that result in the inclusion of participants from vulnerable populations, and/or any change that may increase the risk or discomfort to participants. Changes to key personnel must also be approved. The purpose of review is to determine if the project still meets the federal criteria for exemption.

  Non-exempt research is subject to many regulatory requirements that must be addressed prior to implementation of the study. Conducting non-exempt research without IRB review and approval may constitute non-compliance with federal regulations and/or academic misconduct according to ISU policy.

  Detailed information about requirements for submission of modifications can be found on the Exempt Study Modification Form. A Personnel Change Form may be submitted when the only modification involves changes in study staff. If it is determined that exemption is no longer warranted, then an Application for Approval of Research Involving Humans Form will need to be submitted and approved before proceeding with data collection.

Please note that you must submit **all** research involving human participants for review. **Only the IRB or designees may make the determination of exemption**, even if you conduct a study in the future that is exactly like this study.

Please be aware that **approval from other entities may also be needed.** For example, access to data from private records (e.g. student, medical, or employment records, etc.) that are protected by FERPA, HIPAA, or other confidentiality policies requires permission from the holders of those records. Similarly, for research conducted in institutions other than ISU (e.g., schools, other colleges or universities, medical facilities, companies, etc.), investigators must obtain permission from the institution(s) as required by their policies. **An IRB determination of exemption in no way implies or guarantees that permission from these other entities will be granted.**

APPENDIX C

TEACHER INSTRUCTIONS

As this activity is for research, it is very important that you read and follow the directions carefully to promote reliable data for analysis. Please read these directions carefully and ask the researcher, Sam von Gillern, any questions you may have either face-to-face, via email (samvong@iastate.edu), or over the phone (515-314-1258). Sam will also be present at tutoring for each of the Scratch Jr tutoring sessions, so you could also ask him questions then.

Scratch Jr Introduction Activity - Day 1

- The researcher will spend approximately 25 minutes with groups of tutors and children. He will briefly explain the task (i.e., learning how to use Scratch Jr), and then use the following schedule:
    - 3-minute video on overview of basic functions
        - https://youtu.be/kZqbbdEHU4g
    - 5-minute session where children use and play with the application
    - 3-minute video on using additional functions including oral and written language
        - https://youtu.be/pYl8o6LYntA
    - 5-minute session where children use and play with the application
    - 5-minute video on advanced functions (e.g., connecting multiple scenes and using envelopes that initiate additional actions)
        - https://youtu.be/Qz0Mby4LhM8
    - 5-minute session where children use and play with the application

- Note: All K-2 children will do Scratch Jr activities, but we will only collect data (the stories) from the children whose parents consented to participation and the children who assented.
- For your knowledge, the primary Scratch Jr features are:
    - **Sprites** (characters and objects that can be programmed to do various things)
    - **Backgrounds** and the ability to shift from one background to another via the use of red icons that designate a shift from one background to another.
    - **Yellow icons** to start/initiate the program
    - **Blue movement icons**, which you can adjust the distance of via entering different numbers at the bottom of the icons
    - **Purple/pink icons**, particularly the ones that allow you to create written messages with text
    - **Green icons** that allow you to record audio (including verbal speech and personally made sound effects).
    - **Orange icons** that allow you to program a repeated motion, such as bracketing around blue movement icons to create a repeated pattern of movement

- **Red icons** that allow you to end the program or transition to different background

Teacher Instructions for Days 2, 3, and 4
Children's Story Creation and Data Collection

(Please keep this instruction sheet next to you during days 2, 3, and 4 for your reference)

During days 2, 3, and 4, the children will create his or her own stories. Before they create their own stories on Day 2, everyone in your tutoring room will watch a short video on different types of stories. (Note: watching this sample video will only occur on Day 2. https://youtu.be/QuKP9PqmZGw) Every day before the children create their stories, you need to remind them that can create any type of story they want through using various functions, characters, settings, plots, etc. Here is important information for you as you facilitate this activity.

Remember that the student that he or she can create any type of story he or she wants, which includes that story can be about anything and it can have singular or multiple characters, a singular or multiple settings, and any type and amount of written or oral language

The students are responsible for choosing the content of their own stories including characters/settings/actions/plot/dialogue.

You, the teacher, are responsible for three primary things:

1. *Asking probing questions*
    a. First, ask "What do you want your story to be about?"
    b. Then, if the child struggles with content generation, feel free to ask more specific probing questions:
        i. What do you want as your background?
        ii. What character(s) do you want to use?
        iii. What do you want the character(s) to do?
    c. Note: On the story submission form, please note which types of probing questions you asked during the Scratch Jr session
2. *Providing technical support*
    a. Helping your students use the Scratch Jr application and its technical functions
    b. Note: on the story submission form, when you provide technical support, please indicate what type of technical support you provided.
3. *Taking dictations from the children and entering them into Scratch Jr*
    a. When children decide to use written words in their stories (e.g., for captions or for character dialogue), you will ask them what they want the caption or character to say, and then you will enter those words into Scratch Jr.
    b. This will allow the children to focus on the sentence and meaning rather than the spelling and allow for easier analysis of written text.

c. Also, after the child has finished creating their story, you will ask them what they want the title of the story to be, which you will enter in writing at the Project Information Screen, which you can access by pressing the small orange section in the top right of the screen.

The children will have up to 30 minutes to create his or her story, though they can stop earlier when/if they tell you they are done with their story. Keep track of the time they start, and then if necessary, give them a 10-, a five- and then a one-minute notice that their time is nearly up. Once their story is complete or the 30 minutes are up, please

- Ask them what they would like to name their story
- Write their title on the Project Information Screen (the orange section/button at the top-right of the screen).
- Write the amount of time the child used to create their story on the Scratch Jr Story Submission Form
- Email the story to yourself and the researcher at samvong@iastate.edu).

Then set the iPad to the side and write the amount of time the child used to create their story on the Scratch Jr Story Submission Form. Then, begin your next tutoring activity.

After tutoring is over, please complete the Scratch Jr Story Submission form (both sides), and I will come pick them up.

To recap, your role is to ask probing questions, provide technical assistance, and take the children's dictations when they want to incorporate written text into their stories by typing out the children's words/sentence into Scratch Jr. It is important that you DO NOT tell them what type of story they should create or what words/features/characters/setting/plot they should use.

If the child asks you what the story should be about, you simply can tell him or her "whatever you want it to be about." If he or she pushes for further guidance, you can show him or her character/setting options and/or remind him or her of the different coding features/commands in Scratch Jr, and then you can ask him or her what characters/settings/features they would like to use.

APPENDIX D

SCRATCH STORY SUBMISSION FORM

After the child has finished his or her story, please complete this form and place it inside the iPad cover, and then place it in a visible place on your tutoring table to be collected by the researcher.

Date:_____

Teacher's Name:_____

Child's Name:_____

Time Activity Started _____

Time Activity Ended_____

Total Time the Child Took to Create the Story:_____

Number of iPad Used (listed on the back of the iPad):_____

Story Title:_____
(Note: After the child finishes their story, you will ask him or her what they want the title of the story to be, which you will enter in the Project Information Screen)

Story Number for the Child (circle one): First Second Third

TURN PAGE OVER

Scratch Jr Story Submission Form (Continued)

Notes on Support Provided to the Child

- What types of prompting questions did you ask? Did you need to ask prompting questions frequently? How did the child respond to the prompts? Please elaborate.

- For which technical features did you provide support the child (e.g., movement, assisting with written features through taking oral dictations, using messages, etc.)? For these features, please describe if you provided frequent support, occasional support, or did the child act mostly independently?

General Reflection on the Activity (e.g., child's attitude, confidence, motivation, engagement, etc.):

APPENDIX E

SAMPLE ANALYSES FROM THE CHILDREN'S STORIES

Example Analysis 1 - Story - Tac and the Fairy

Structural Pattern

- Action Sequence
  - "Many actions are logically ordered, but prior actions did not actually cause later actions to occur" and "actions are chronologically rather than causally ordered" (p. 71-72)

Story Elements

- Actions (8 total: 4 visual, 3 written, 1 oral)
  1. *Scene 1* - Tac and Tac pass ball back and forth (visual)
  2. Green Tac says "That was fun" (written)
  3. Purple Tac says "That was really fun" (written)
  4. *Scene 2* - Fairy flies around (visual)
  5. Fairy says "I am going to sleep" (written)
  6. Fairy disappears (visual)
  7. *Scene 3* - Fairy moves in bedroom (visual)
  8. Fairy yawns (oral)
- External States (9 total: 9 visual)
  1. Setting - Moon (visual)
  2. Character - Green Tac (visual)
  3. Character - Purple Tac (visual)
  4. Object - Ball (visual)
  5. Setting - Outerspace (visual)
  6. Character - Fairy (visual)
  7. Object - Stars (manually added by student) (visual)
  8. Object - Earth (manually added by student) (visual)
  9. Setting - Bedroom (visual)
- Internal States
  - Absent
- Natural Occurrences (2 total: 2 visual)
  1. Scene change - Moon to Outer space (visual)
  2. Scene change - Outer space to bedroom (visual)
- Summary
  - 19 total story elements
    - 15 visual
    - 3 written
    - 1 oral

Example Analysis 2 - Story: Tacky Land and Tacky

Structural Pattern

- Reactive Sequence
    - Character movement and dialogue follow logical sequences, but there isn't evidence of goals nor goal-directed behavior

Story Elements

- Events (7 total: 2 visual, 5 written)
    1. Purple Tac 1 Floats up and away (visual)
    2. Purple Tac 1 says "Aaaaaa!" (written)
    3. Black Tac says "Hey look up there!" (written)
    4. Purple Tac 2 says "What's that? (written)
    5. Blue Tac says "I don't know!" (written)
    6. Grey Tac says "I think it's Tacky!" (written)
    7. Scene Change from Moon to Desert (visual)
- Motivating States
    - Absent
- Attempts
    - Absent
- Consequences
    - Absent
- Reactions (5 total: 5 written)
    1. Purple Tac 1 says "Aaaaaa!", reacting to floating up and away (written)
    2. Black Tac says "Hey look up there!", reacting to Purple Tac 1 (written)
    3. Purple Tac 2 says "What's that?, reacting to Black Tac (written)
    4. Blue Tac says "I don't know!", reacting to Purple Tac 2 (written)
    5. Grey Tac says "I think it's Tacky!", reacting to Blue Tac (written)
- Settings (7 total: 7 visual)
    1. Setting - Moon (visual)
    2. Character - Purple Tac 1 (visual)
    3. Character - Purple Tac 2 (visual)
    4. Character - Black Tac (visual)
    5. Character - Blue Tac (visual)
    6. Character - Grey Tac (visual)
    7. Setting - Desert (visual)
- Judgements
    - Absent
- Appendages
    - Absent
- Summary
    - 19 total story elements
        - 9 visual
        - 10 written

Example Analysis 3 - Story: Fun Scratch Jr

Structural Pattern

- Complete Episode
  - Contains
    - Events
    - Motivating States – Trying to find the swimsuit
    - Attempt – Them looking around the room (inferred)
    - Consequence – They find the swimsuit ("I found them")

Story Elements

- Events (15 total: 8 visual, 7 written)
  1. *Setting 1* - Child says "Oh no we don't have swimming suits" (written)
  2. Child moves (visual)
  3. Teen moves (visual)
  4. Teen says "You are smart!" (written)
  5. Scene changes from Beach to Bedroom (visual)
  6. *Setting 2* - Child says "Let's get our swimming suits." (written)
  7. Teen says "Okay." (written)
  8. Child moves, as if looking for swimsuit (visual)
  9. Teen moves, as if looking for swimsuit (visual)
  10. Teen says "I found them!" (written)
  11. Scene changes from Bedroom back to Beach (visual)
  12. *Setting 3* - Teen says "We are ready!" (written)
  13. Teen moves (visual)
  14. Child moves (visual)
  15. Child says "Yes" (written)
- Motivating States (1 total: 1 written)
  1. Child says "Let's get our swimming suits", indicating her goal of locating swimming suits (written)
- Attempts (1 total: 1 visual)
  1. Children move around the room immediately after child says "Let's get our swimming suits", indicating they have begun looking for the swimsuits (visual)
- Consequences (1 total: 1 written)
  1. Teen says "I found them!", indicating that the children have accomplished their goal of finding their swimming suits (written)
- Reactions (4 total: 4 written)
  1. Teen says "You are smart!" in response to the child saying "Oh no we don't have our swimming suits" (written)
  2. Teen says "Okay" in response to child saying "Let's get our swimming suits." (written)
  3. Teen says "We are ready!" in response to the consequence of finding their swimsuits
  4. Child says "Yes" in response to teen saying "We are ready!" (written)
- Settings (4 total: 4 visual)
  1. Setting - Beach (visual)

2. Character - Child (visual)
3. Character - Teen (visual)
4. Setting - Bedroom (visual)

- Judgements
  - Absent
- Appendages
  - Absent
- Summary
  - 26 total
    - 13 visual
    - 13 written